NEWS IN PERSPECTIVE *DECEMBER 15, 1961*

MANAGEMENT VIEW

UTILITY FINANCING WHIRL last month involved many power companies with impressive actions in the money market. Top figure, for example, was the $60,-million issue of first and refunding mortgage bonds by ConEdison on Nov. 21; but there were other big ones: Arizona P.S., completed the largest single financing project in state history with a $35-million first mortgage bond sale; Carolina P.&L. made an award on $25-million of first mortgage bonds; Dallas Power raised $10-million by selling 100,000 shares of preferred; and Cincinnati G.&E. Co. negotiated a revolving credit agreement enabling the utility to borrow up to $20-million in short-term notes from a group of banks. And, for this month, Commonwealth Edison planned a $40-million debenture issue for Dec. 13; while the biggest securities program scheduled for '62 is PG&E's proposed $98-million sale, probably of bonds. (At the end of 1960, net investment in all utility plants owned by the private electric companies topped $40-billion—$40,444,000, says the FPC.)

"OPEN TO THE PUBLIC"—An EEI survey, reported to the Institute's Area Development Committee last month, shows that over half of the 122 investor-owned companies responding have non-urban land and/or water areas open to public recreation, while 89 indicated they have utility facilities open to the public. Most common recreation uses are for picnicking, camping, boating; most common facility is the power company auditorium—60 companies indicate a total of 568 of them. (For a critic's view of utility area development effort, see page 59.)

PERFORMANCE, NOT PROMISES—Judge us accordingly, say Northern States Power Co., which met a key franchise referendum head on in the So. Dakota town of Salem on Dec. 12. Winner of two previous votes on electric service in Salem this year, NSP campaigned vigorously again, matched benefits of its service in the community against the disadvantages of duplicating electric service and facilities. New franchise is sought by co-op—McCook Elect. Co.

WHO PAYS FOR "NEAR" is the big unanswered question in Civil Defense. Electrical groups (EEI, NRECA, APPA) were on record as opposed to paying for installing and operating the warning system on electric power lines; and the Defense Dept.'s OCD was reported to be unwilling to foot the bill. Utility companies are reluctant to get in the position of "selling" survival devices —the receivers, for example. As in the dilemma over fallout protection, clarification by the Administration was sorely needed.

ADOPTION OF SUPERCRITICAL PRESSURE called for new design concepts...and the successful operation of Eddystone can be attributed to the cooperation among the major equipment manufacturers and our company, said Philadelphia Elect. Co.'s Pres. R. G. Rincliffe last month in dedicating the 726,000-kw station. Involved in supplying major components for this largest plant in the nation operating at supercritical steam conditions were many manufacturers whose "intensive research and development programs went beyond normal commercial considerations," Mr. Rincliffe pointed out.

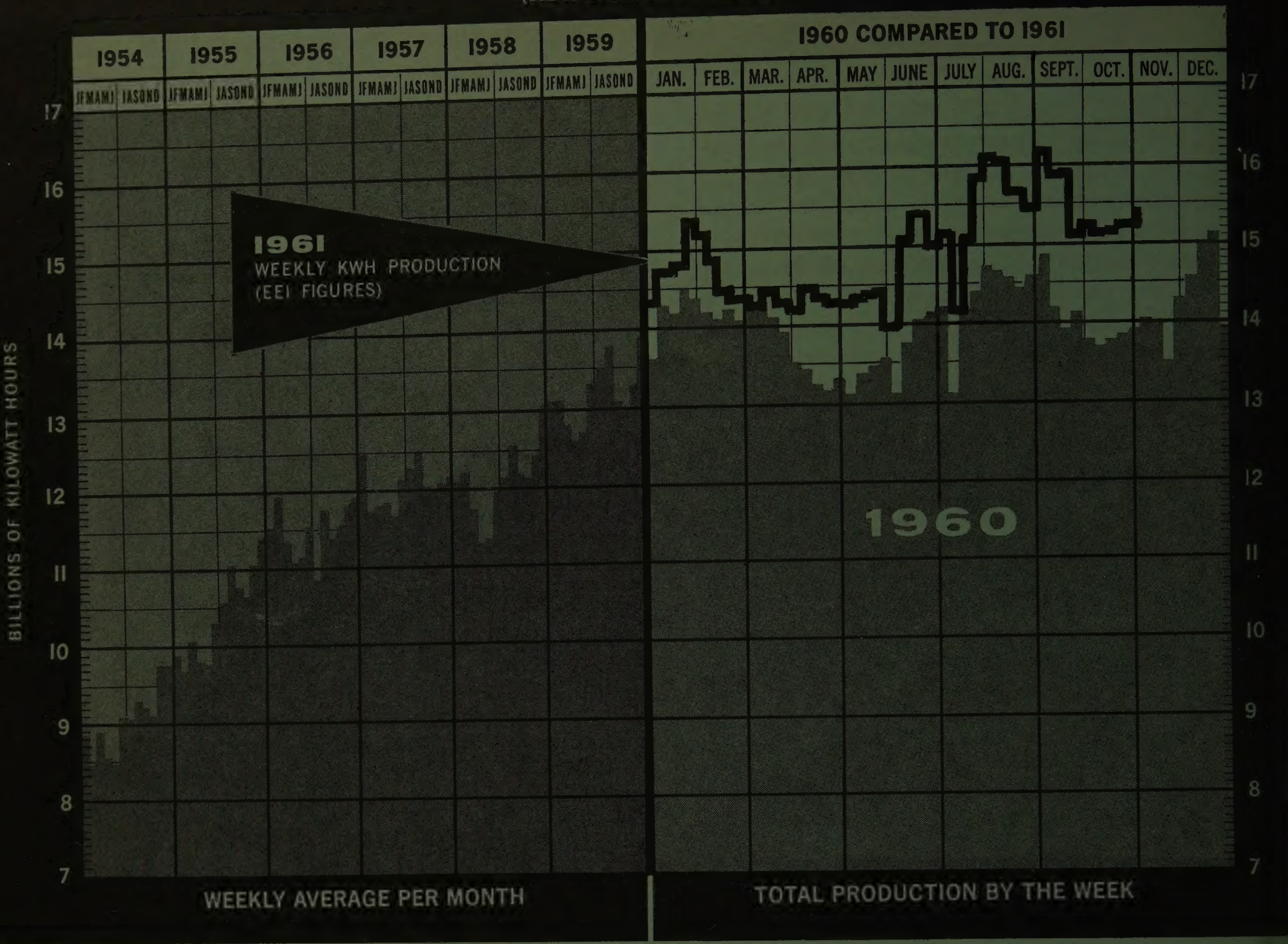
LARGE POWER REACTORS, in the size of 500,000-kw, are the goal of the East Central Nuclear Group, Inc., which is making a survey of three types of reactors—all heavy-water moderated, each using a different cooling medium. At the AEC's suggestion, the 14-company group expects to determine "the probable cost of energy and the estimated effort required to solve technical problems" involved. (More optimism is reported at the nuclear conferences in Chicago last month—see page 57.)

ECONOMIC CLIMATE

CONSUMER PSYCHOLOGY is improving, and the year-end sales upsurge is likely to be followed by a smaller than usual dip. Incomes are rising (disposable income went up four percent or so this

Electric Utility Barometer

(Source: Edison Electric Institute)



NEWS IN PERSPECTIVE

year), and the consumer's credit position is favorable. Peoples' buying plans show no signs of a runaway boom, but growing confidence is apparent. Three worries probably will keep people a bit cautious, thereby contributing to price stability: fear of recession, unemployment, and the outbreak of war.

INVENTORY GROWTH, likely to speed up in the near future, has been rather erratic in 1961. At the beginning of the year, inventory buying zoomed, but then it slowed markedly. It was, nevertheless, responsible for about one-third of the gain in total output of goods and services that took place in the year's first nine months. From the first quarter, when inventories were dropping at a seasonally-adjusted annual rate of $4-billion to the third quarter when they were growing at a $4.5-billion rate, there was a change of $8.5-billion. Concurrently, total output rose $25.2-billion. Note, however, that inventories gained $6.8-billion from the first quarter to the second, but they rose only $1.7-billion from the second period to the third. Chances are that inventories will continue to build slowly. Early in the new year, there is some possibility that steel production will show some excess gains as a result of buying intended to build up stocks against the possibility of a strike in June. And, of course, some businessmen are deferring purchases until January, giving themselves a chance to be eligible for the eight-percent investment incentive tax credit that Congress may enact.

WASHINGTON INFLUENCE

STRESS ON G&T LOANS is a constant theme of REA spokesmen. Administrator Clapp has made this clear on several occasions, as have other officials. Since "the cooperatives will need even more power in the future," investorwned utilities are constantly reminded hat REA's plan to drive a hard bar-ain. Co-ops' use of power is expected o double by 1970, and to double again uring the 1970s. With this growth learly in his mind's eye, an official arned that REA's "are going to do business with those who offer reasonable erms." It was made apparent that if EA's are offered "wholesale power contracts that carry unreasonable rates, hat restrict loads, and threaten the uture existence and security of rural ystems" they will be given an opportunity to go into the power generation business with the help of a loan from the government. (See page 62.)

REA G&T LOAN OF $20-MILLION goes to Alabama Electric Co-op, a federation of REA-financed distribution co-ops in southern Alabama and northern Florida. $12-million will finance building a 66,000 kw steam-electric generating plant and $8.35-million will be used to construct about 700 miles of transmission line. Capacity of the system will be more than doubled. REA Administrator Clapp said approval was based on two criteria—cost of power and the security of the systems involved. This represents the first use by the agency of the controversial "third criterion." Clapp explained in some detail the "background of persistent and demonstrated hostility of the power supplier" and concluded the co-op systems "require a source of power completely dedicated to their interests." He explained that both "the present relationship and possible future conflicts of interest" must be considered "in the light of a long history of friction and hostility" between the co-ops and Alabama Pwr. Co.

HIGHER RATES for some sales of the Southeastern Power Administration to TVA are urged by the Comptroller General—an official charged by Congress with auditing the books of other agencies. The Comptroller General, citing the $23.8-million loss incurred by SEPA in the 1950-1960 decade, said that some $16.3-million of this loss is attributable to sales by SEPA to TVA at a rate intended to provide a return on investment of two percent. The auditing agency also observed that the Interior Department had declined to modify its sales agreement for this SEPA power so as to bring the return up to the 2½-percent recommended by the Federal Power Commission. Now, the Comptroller General wants the President to order Secretary Udall to charge the higher rate recommended by FPC. This recommendation had earlier been made by the Comptroller General in 1959.

104 NEW CONSTRUCTION JOBS to cost $130-million will be put out for bids by the Reclamation Bureau in the West during the coming eight months. Seven earthfill dams are planned—completion of Glen Canyon among them. Transmission lines scheduled include 1,060-miles on Colorado River Storage and 320-miles on the Missouri River Basin. Blue Mesa's powerplant (60,000-kw capacity) and six pumping plants and substations are also on the list, which includes laterals and drains. The jobs range from $20,000 to more than $15-million.

REVISED FPC REGULATIONS will enable non-federal hydro power developers to enter into settlement agreements for the amount of headwater benefits to licensees and permittees. If the parties agree and FPC subsequently approves, non-federal project operators will be spared the expense of a formal FPC determination.

FTC INVESTIGATION of electric equipment manufacturers received a setback when a Federal Judge refused to let the agency see the grand jury transcript in the Philadelphia cases, even though the Justice Department requested this. FTC wants to know if its 1937 order against equipment firms to stop fixing prices on turbine generators and condensers was violated. Each violation of an FTC order carries a fine of $5,000.

BEST SYSTEM GENERATING EFFICIENCY for steam is found at TVA, says FPC in "Steam-Electric Plant Construction Cost and Annual Production Expenses" (available for $1.25 from the Superintendent of Documents, GPO, Washington 25, D.C.). In 1960, nine companies had over-all system heat rates of less than 10,000 BTU's per net kwh. The top-ranking systems are: TVA; Duke Power Co.; American Electric Power Co.; Southern California Edison Co.; Consumers Power Co.; Carolina Power & Light Co.; Niagara-Mohawk

Power Co.; South Carolina Electric & Gas Co.; and Potomac Electric Power Co. Each is generating one kwh with less than a pound of coal.

INDUSTRY SIFTINGS

ELECTRICAL PRODUCT SHIPMENTS are expected to set a record high value of about $25-billion in 1962, predicts NEMA's retiring president, A. D. R. Fraser, who is also president of Rome Cable. An increase of more than a billion dollars in volume of business next year may come, on top of an anticipated peak value of $23.5-billion in '61—probably equalling the all-time high of '60. Mr. Fraser noted in a report to the NEMA annual meeting that "all electrical manufacturers are not doing so well ... and there are some soft spots in 1961 orders." But, he reported, increases in business volume—of from 2- to 10-percent—are expected in all lines of electrical products in '62.

HIGH-VOLTAGE "AESTHETICS"—That's what Olin says is achieved by a streamlined, 115,000-volt transmission line, which "some engineers believe may mark the beginning of a nationwide program to improve the appearance of power lines as rising needs for electricity call for higher-voltage transmission into congested areas." A newly installed 3½-mile line on the New Orleans P.S. Co. system utilizes a specially designed tapered aluminum transmission tower (called Oct-o-Quad by McGraw-Edison's Altrectic division) and a new aluminum conductor cable, compressed to a 10-percent smaller diameter by Olin Conductor's Compresto process. The utility's extra efforts and somewhat higher equipment costs are "more than compensated for by public reaction called 'gratifying.'"

"CHARGE BIG USERS MORE," the Commission told ConEdison last month in agreeing to rate increases that may go into effect on Dec. 20 and provide an additional $10.5-million in gross annual revenue. But, to get this, ConEd is ordered to charge 3500 users in commercial and industrial classifications $18-million more, cut about $8-million from the bills of small residential and commercial customers.

FEDERAL ANTI-TRUST ACTIONS continue to add up to a case of likely profit only for the lawyers, most utility company officials concede. Sampling of moves last month: Arizona P.S. Co.'s suit for $26-million against the "Big Three" for alleged overcharges on seven turbine-generator units; Federal Pacific's estimate of expenditures to date of about $125-thousand on legal fees; the Pennsylvania Commission's decision to appeal a U.S. district court ruling that would bar the Commission from intervention in the price-fixing damage suits filed by the Philadelphia Elect. Co.; but, in Illinois, the state's atty. general prepared intervention proceedings asking that any damages recovered by utilities be passed on to consumers.

EEI's PLANS-FOR-THE-FUTURE campaign projecting a more forceful industry image to the public is gaining encouraging support from member companies, the Institute reports. Evidence: sale of nearly 150,000 presentation booklets, 1700 desk-top chart books, 211 descriptive film strips by mid-November—less than three months after distribution began.

HOME IMPROVEMENT CONTEST to be launched next month by "Better Homes and Gardens" will make retail lighting and appliance dealers "official contest headquarters," open up big profit opportunities in 1962's potential multi-billion dollar home improvement market, the publication promises. Another incentive: $30,000 in cash prizes for homeowner contestants.

EXTENDED PAYMENT FINANCING available through General Electric Credit Corp. is being recommended to utility power salesmen as an added source which can help in breaking financing bottlenecks on electrical modernization or new construction projects.

CYCLONE FURNACE BOILER, a direct-firing arrangement that eliminates the need for costly coal-handling equipment was demonstrated by Babcock & Wilcox last month at a Jersey Central P. & L. Co. station ... gave a boost to large-scale pipeline transportation of coal.

EL&P
ELECTRIC LIGHT AND POWER
THE MAGAZINE OF ELECTRIC-UTILITY TECHNOLOGY

How Gulf States Utilities Co. attracts large industrial customers by providing quality service at reasonable competitive rates, tailored to customer demands. Standard designs, bulk purchases and planning ahead reduces costs.

Quality Service ATTRACTS INDUSTRIAL CUSTOMERS

By L. V. DUGAS, Manager, Industrial and Commercial Sales,
and Y. L. HUGHES, Supervisor of Project Engineering,
Gulf States Utilities Co.

PROVIDING QUALITY SERVICE is very important in the sale of electric service. We find that it is just as important as having good electric rates in attracting industry to our Gulf Coast service area.

Gulf States has added more than a dozen large industrial customers in the past three years having total contract power of almost 300,000 kw in blocks ranging from 3,000 to 40,000 kw.

Oil companies and petrochemical companies require a very high degree of service continuity and usually want service from two or more Gulf States' sources. They frequently want extra breakers and other protective equipment, and it is not unusual for such customers to want 40,000 kva in transformer capacity to serve a 20,000 kva load. Our Engineering department calls this kind of duplicate equipment "gold plating" and in the past, when we tried to apply one power rate to all kinds of power customers, we had the greatest difficulty internally between the Sales Department and the Engineering Department to get the amount of gold plating that some customers just had to have.

Realizing that to attract industry our rates had to be competitive with our neighboring utilities and, also, that the quality of service was of prime importance because of critical processes involved, we set out to design two rates that would be low enough in cost to entice industry to our area, and flexible enough to render the quality of service required by some companies. Before designing new rates we talked to our friends in industry and found that most companies do not want to own and maintain high voltage facilities for two reasons:

1. They do not want to keep a maintenance crew on their payroll.

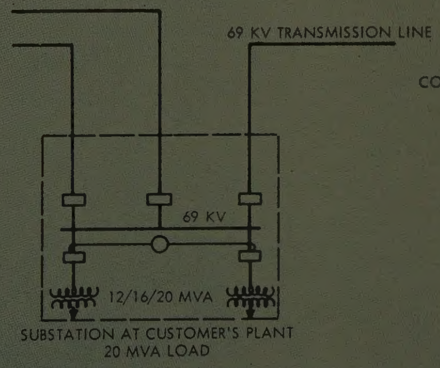
2. Industry is not in the electric business — we are. Industry can earn more by investing in production facilities and, therefore, do not want to put their money in electrical facilities. Utilities are regulated and are generally limited to a return of around 6 percent, while industry can earn much more.

We therefore designed two power rates that would be flexible and would give industry the option of owning the substation, transformer, and appliances. It would also give them the privilege of designating the standard equipment to provide the quality of service they desire at a reasonable cost, which provides a fair return to us. Our rates 417 and 419 provide one way of handling such customer demands.

Rate Schedule 417

Rate Schedule 417 is available for loads of 2,500 kw and up and is the usual Block Hopkinson demand form of rate, with a 50 percent demand ratchet. We have added to

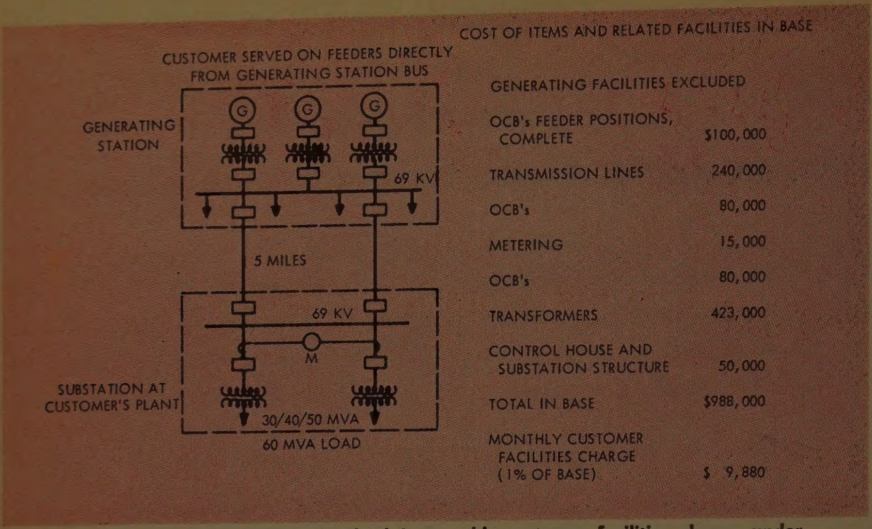
Fig. 1—Diagram of facilities involved in monthly transformer charge under Rate Schedule 417.



*BASE FOR MONTHLY TRANSFORMER CHARGE UNDER SCHEDULE 417 EXCLUDES TRANSMISSION LINES, METERING, AND SWITCHING ON THROUGH HIGH TENSION LINES.

COST OF ITEMS AND RELATED FACILITIES IN BASE

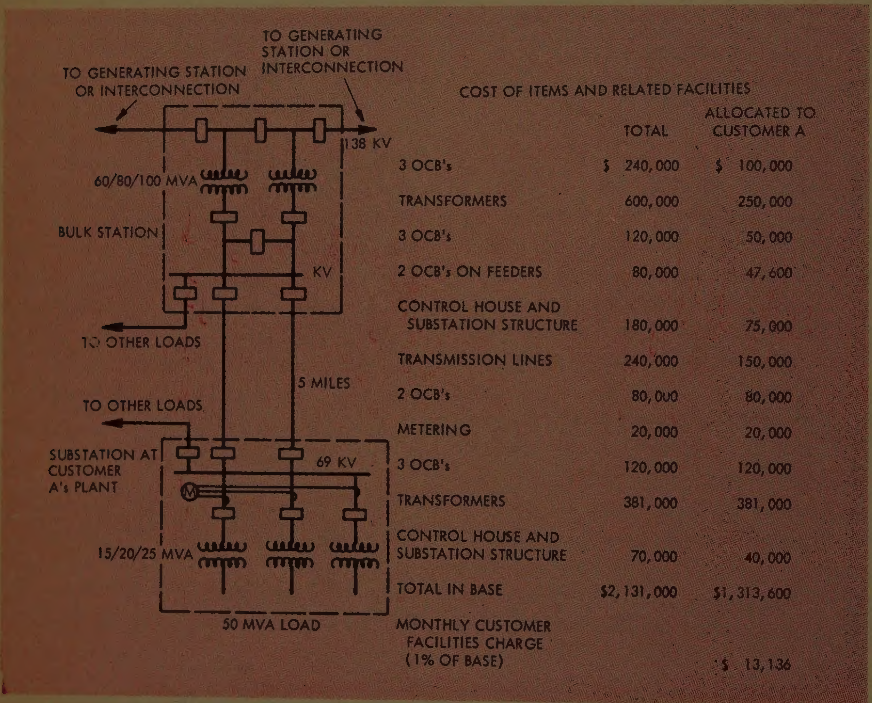
*TRANSMISSION LINES	$ 0
*OCB's ON THROUGH HIGH TENSION LINES	0
*METERING	0
OCB's ON TRANSFORMERS	80,000
TRANSFORMERS	172,400
CONTROL HOUSE AND SUBSTATION STRUCTURE	20,000
TOTAL IN BASE	$272,400
MONTHLY TRANSFORMER CHARGE (1% OF BASE)	$ 2,724


CUSTOMER SERVED ON FEEDERS DIRECTLY FROM GENERATING STATION BUS
GENERATING STATION
G
69 KV
5 MILES
69 KV
M
SUBSTATION AT CUSTOMER'S PLANT
30/40/50 MVA
60 MVA LOAD

COST OF ITEMS AND RELATED FACILITIES IN BASE	
GENERATING FACILITIES EXCLUDED	
OCB's FEEDER POSITIONS, COMPLETE	$100,000
TRANSMISSION LINES	240,000
OCB's	80,000
METERING	15,000
OCB's	80,000
TRANSFORMERS	423,000
CONTROL HOUSE AND SUBSTATION STRUCTURE	50,000
TOTAL IN BASE	$988,000
MONTHLY CUSTOMER FACILITIES CHARGE (1% OF BASE)	$ 9,880

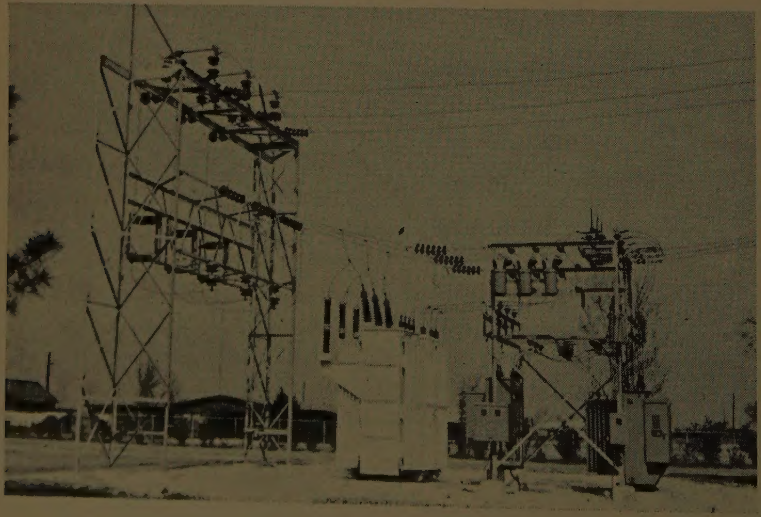
Fig. 2—Diagram of facilities involved in monthly customer facilities charge under Rate Schedule 419. (Service from 69-kv station bus.)

Fig. 3—Diagram of facilities involved in monthly customer facilities charge under Rate Schedule 419. (Service from 138-kv bulk station.)


TO GENERATING STATION OR INTERCONNECTION
TO GENERATING STATION OR INTERCONNECTION
138 KV
60/80/100 MVA
BULK STATION
KV
TO OTHER LOADS
5 MILES
TO OTHER LOADS
SUBSTATION AT CUSTOMER A's PLANT
69 KV
M
15/20/25 MVA
50 MVA LOAD

COST OF ITEMS AND RELATED FACILITIES	TOTAL	ALLOCATED TO CUSTOMER A
3 OCB's	$ 240,000	$ 100,000
TRANSFORMERS	600,000	250,000
3 OCB's	120,000	50,000
2 OCB's ON FEEDERS	80,000	47,600
CONTROL HOUSE AND SUBSTATION STRUCTURE	180,000	75,000
TRANSMISSION LINES	240,000	150,000
2 OCB's	80,000	80,000
METERING	20,000	20,000
3 OCB's	120,000	120,000
TRANSFORMERS	381,000	381,000
CONTROL HOUSE AND SUBSTATION STRUCTURE	70,000	40,000
TOTAL IN BASE	$2,131,000	$1,313,600
MONTHLY CUSTOMER FACILITIES CHARGE (1% OF BASE)		$ 13,136

Fig. 4—New standard design for distribution substation making use of one high voltage structure and one low voltage structure 69-kv and 13.2-kv wye.



this rate a "transformer charge" that specifies that customer shall pay 1 percent per month on the installed cost of the substation facilities (exclusive of metering) used to serve him. We include in the figure the transformers, switchgear, breakers and other protective equipment, busses, substation structure, etc., in other words, the complete substation. Under this arrangement we are willing to install for the customer spare transformer capacity, extra breakers, etc., since he is paying the freight. (See Figure 1) We do require, however, that he stick to standard equipment.

Rate Schedule 419

Rate 419 is available for loads of from 20,000 kva to 90,000 kva and billing is on a contract power basis. The rate is $1.90 per kva and 1.9 mills per kwhr. At 90 percent load factor, with fuel at our current price of 18¢ per million Btu this produces 5.3 mills per kwhr. To this we add a "facilities charge" of 1 percent per month based on the total cost of transformers, breakers, lines, substation and related facilities that are used in getting service from a trunk transmission line to customers utilization bus. (See Figures 2 and 3)

Engineering Facilities

During the past 42 years and especially during the last ten, the attitude of the electric utilities to its customers has undergone a very noticeable change. At one time, the essential problems were expansion and improvement of technical facilities. The engineer was considered much more important than customer relations, and the customer receiving special favors was indeed fortunate.

With the electric utilities facing rising demands, inadequate facilities and a need for new capital, customer relations has gained a new respect. Since this is the position in which some utilities find themselves, every effort is being made to induce more customers to use more power. This is accomplished, in my Company, by offering the customers the class of service they desire, and at a rate which they can afford.

Coordinated Effort

This type of customer approach requires the coordinated efforts of both the sales and engineering groups. The sales people have done an outstanding job of selling increased business to present customers and new business to new customers. The growth and life expectancy of the power sales efforts are directly proportional to the engineering people's ability to:

1. Reduce costs of generation.
2. Reduce costs of transmission and distribution lines.
3. Reduce costs of transmission and distribution substations.
4. Plan intelligently.
5. Provide continuity of service.
6. Establish reasonable working policies between the customer and the Company.
7. Work wholeheartedly with the customer in his planning.
8. Be prompt in supplying customer with requested information.
9. Make promises and keep them.

Reduced cost of generation has been accomplished by: regrouping of personnel, installation of central information systems, the replacement of plant guards with TV and by careful planning of generating facilities with respect to existing and proposed transmission facilities.

Standardizing

Reduced costs of transmission and distribution lines and substations have been accomplished by standardizing on materials, types of line, and substation structures.

We are now using one standard design for each voltage, 15, 69 and 138 kv. If a new station is required or additions to an existing station are necessary, the engineer knows exactly what steel will be used. All of our steel suppliers have drawings of our standard substation designs.

All 69-kv H-frame lines are constructed for future conversion to 138-kv operation regardless of forseeable needs. Our standard size conductors are 336.4 MCM, 795 MCM and 1033.5 MCM ACSR and all aluminum. Single-pole wood structures are used for 69-kv lines along city streets and in urban areas where H-frame structures cannot be used.

By making use of standard line

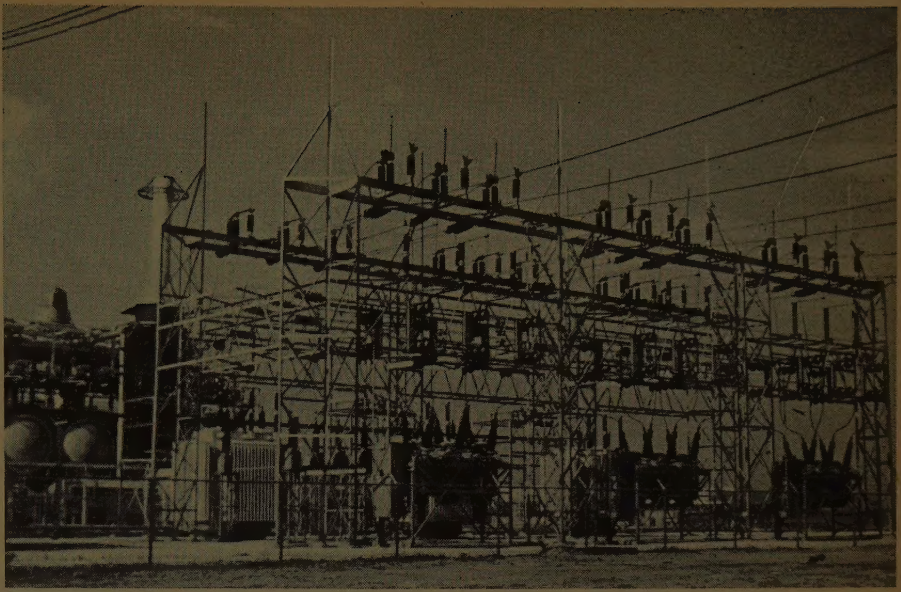


Fig. 5—Substation showing how the single high voltage structure in Fig. 4 may be expanded to accommodate additional incoming 69-kv circuits and distribution transformer banks.

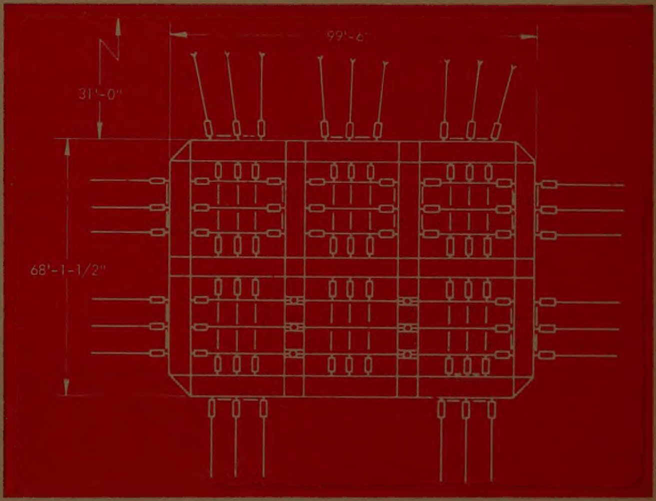


Fig. 6—Plan view of the steel and bus arrangement possible to obtain by use of the standard 69-kv steel design.

Fig. 7—Plan view of bulk stations with three 60/80/100 MVA 132-69-kv transformers.

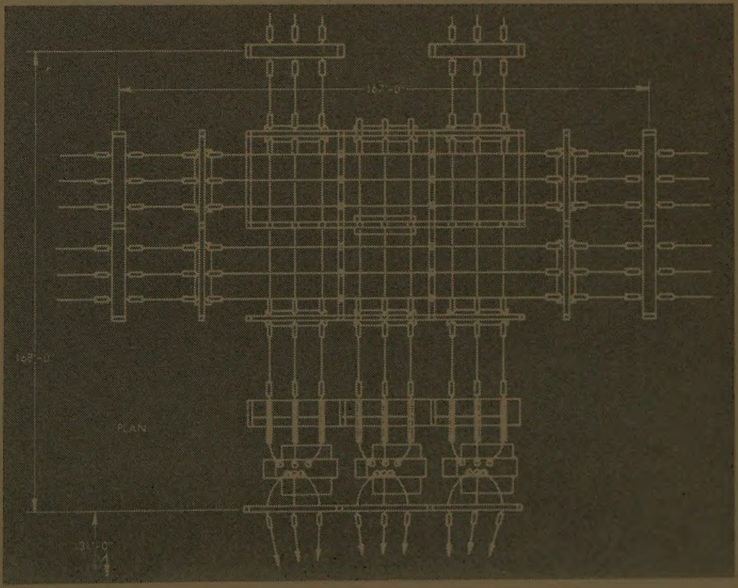
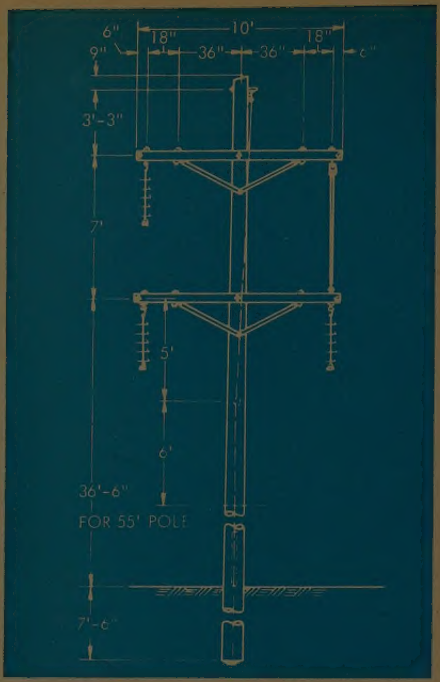


Fig. 8—A typical 69-kv single-circuit line design used along city streets.



and substation designs, we have been able to reduce inventories 50 percent, engineering 60 percent, materials 15 percent, and construction labor 20 percent.

During the year, we plan our construction program for the following year; and we submit to purchasing a list of major items to be secured. This list includes: transformers, oil circuit breakers, regulators, current transformers, potential transformers, lightning arresters, pedestal insulators, 10-in. suspension insulators, steel, switches, wire, poles, and capacitors. In 1960, the Purchasing Department in making bulk purchases was able to show a saving of $2,489,597.00. This represents approximately one-twentieth of the year's total budget.

Planning Ahead

Presently, we are planning our budget for five years ahead and planning our generating capacities, transmission lines, bulk substations, and distribution substations ten years ahead. One very important reason for this is to be able to assure the larger power customers that their power requirements will be satisfied. At the same time, the customer is informed as to the potential reliability of service. We feel that the best insurance for obtaining new business is to show a sincere willingness to understand the customers' problems and to have the desire to assist in overcoming the problems. Prompt action is necessary in answering any questions.

General Policies

Reasonable policies must be established that will not place an undue burden on either the customer or the company. Generally these policies prevail:

1. If a voltage swing of 5 percent above or below normal cannot be tolerated by the customer, he should provide the corrective facilities.

2. Standard utilization voltages are 2400, 4160Y, and 13,200Y.

3. Standard transformer sizes are 3,750/4,687, 5,000/6,250, 7,500/9,375, 10,000/12,500, 12/16/20, 15/20/25, 24/32/40, and 30/40/50 MVA in the 69-kv class. If the customer desires any other size or any

Fig. 9—Standard 15-ft H-frame structure used for single-circuit 138-kv construction on private rights of way.

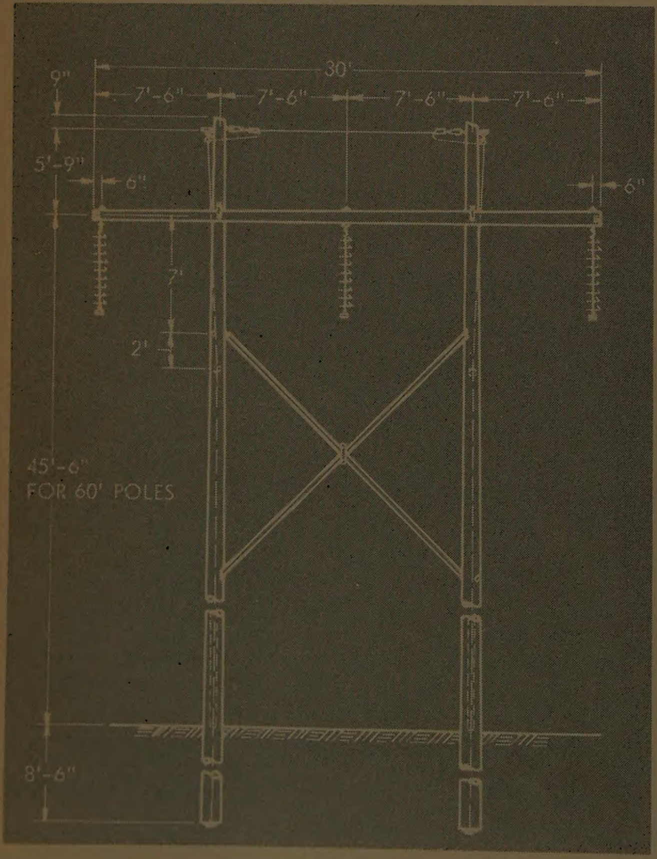
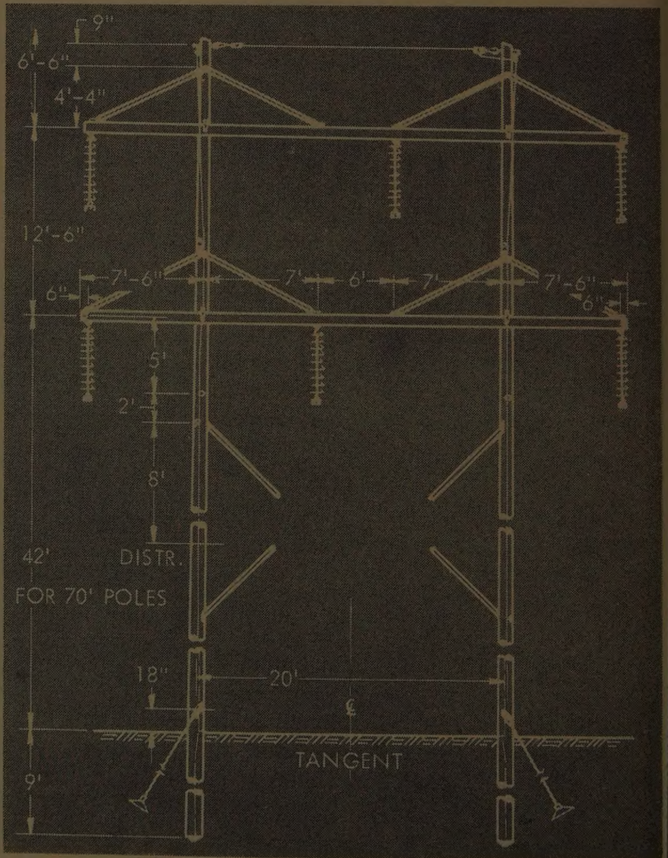


Fig. 10—Two-circuit 138-kv structure will accommodate two 220-kv circuits or a combination of 69, 138, and 220-kv.



other voltage, he should purchase and own same.

4. Back-up relaying is provided at all bulk stations.

5. The steel being used is our standard design.

6. Metering is on the primary or high voltage side of the transformers and consists of a kwhr, kva, kvar lead and kvar lag meters.

7. Contracts are provided for the customer's use if he prefers to have his own check metering facilities.

8. Control houses are normally of the pre-fab type; however, if the customer desires a brick building, it will be installed.

9. Lot sizes are kept to a minimum; however, we do make an earnest effort to obtain sufficient space for access to the station and for installation and replacement of major equipment within the station.

10. The customer's facilities and the company's facilities are fenced separately.

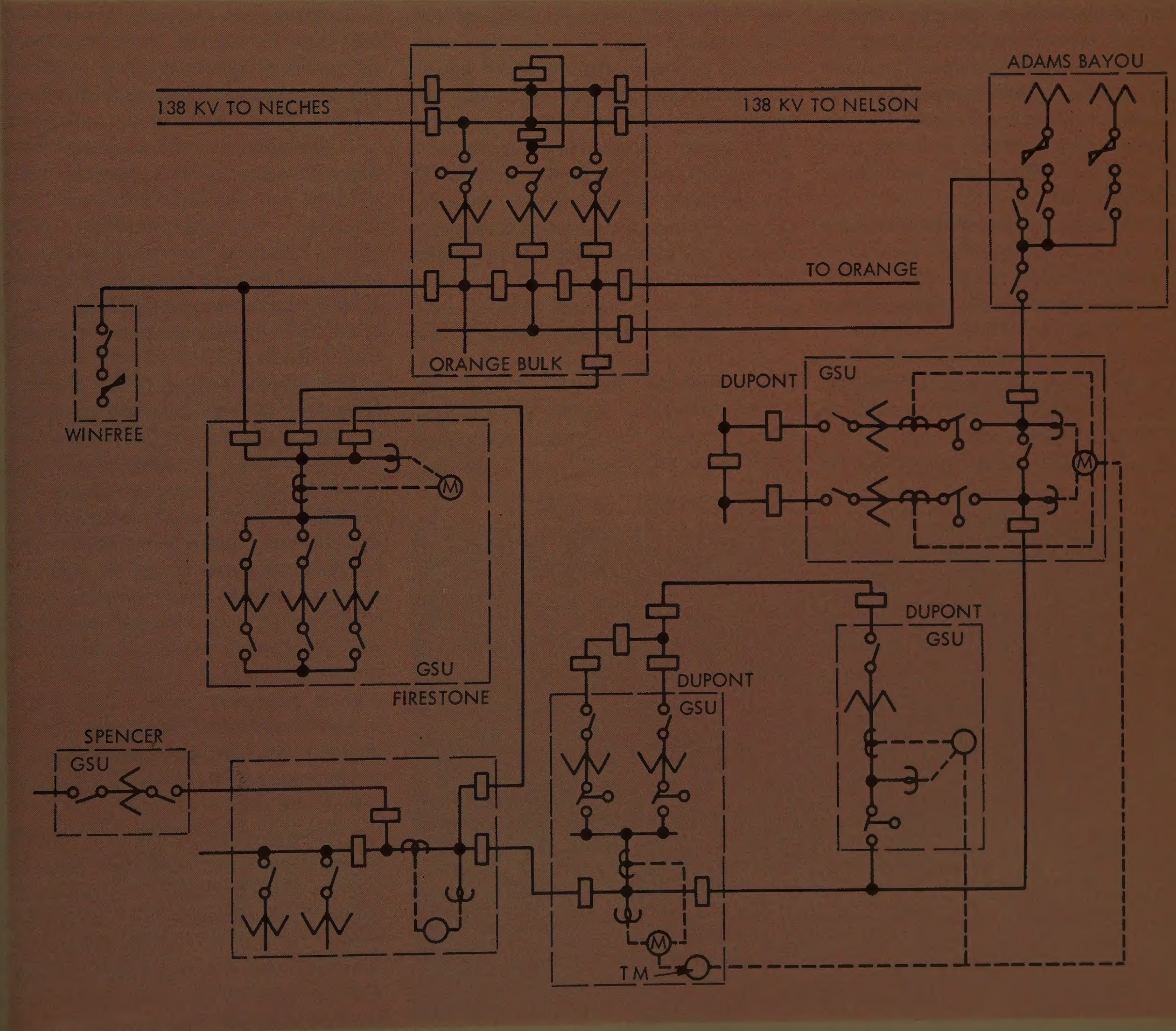
11. Secondary feeders or bus tie breakers are installed, owned, operated and maintained by the customer.

12. In providing the customer with reliable service, it is our policy to provide loop line service wherever it is reasonable to do so and provided the class of service warrants it. One method is to provide sectionalizing switches in the lines terminating in the substation, and the other is to provide oil circuit breakers in the station for automatically sectionalizing line faults. This policy is governed mostly by the importance of continuity of service and by the size load. Of course, we get an assist from the customer if his load is 20,000 kva or more; but if the load is less than 20,000 kva or if the 20,000 kva customer elects to use the same rate as the customer having a load less than 20,000 kva, the extra cost of providing loop line service is borne by the company.

13. Transformer charges and facilities costs are prepared from detailed estimates using actual cost data.

We have found that it is considerably less expensive to serve customers at 69 kv than at 138 kv provided there is a choice or unless the customer's load requirements are very near 100,000 kva.

Fig. 11—One line diagram of circuit arrangements for serving customers on both Rates 417 and 419.



Specialized machinery, developed for research laboratories and chemical processors, is adapted to RG&E's Alex Beebee station to provide high quality water at high flowrate and at low operational cost.

METERING DIFFICULT LIQUIDS

Without Leakage

HOW DO YOU STOP corrosive liquids from raising havoc with pumping equipment? Rochester Gas & Electric Company did it by specifying a feed system in which there is no leakage, and chemicals are isolated from working parts of pumping and metering equipment. In addition to strong corrosives and alkalies, the system safely handled hydrazine—a toxic, flammable, easily-oxidized solution—without contamination, spillage, or accumulation of vapors.

Prior to equipping their new Alex Beebee generating station, RG&E studied common drawbacks to the efficient pumping of water treatment chemicals. These included:

(1) Pump leakage of from one to three drops of chemical per stroke; a condition that is costly as well as dangerous to personnel.

(2) Frequent replacement of parts which have eroded or corroded from exposure to the chemicals being handled.

(3) Loss of pump capacity.

As RG&E's boilers increased into the area of problem pressures, need for high quality pumping equipment and greater control in the demineralizing process became more acute. If the chemical feed system was not dependable—due to loss of capacity from pump plunger wear, leakage of chemicals, or from lack of availability because of excessive maintenance—boiler scale would form, corrosion of piping, and high repair costs would result.

Special Equipment

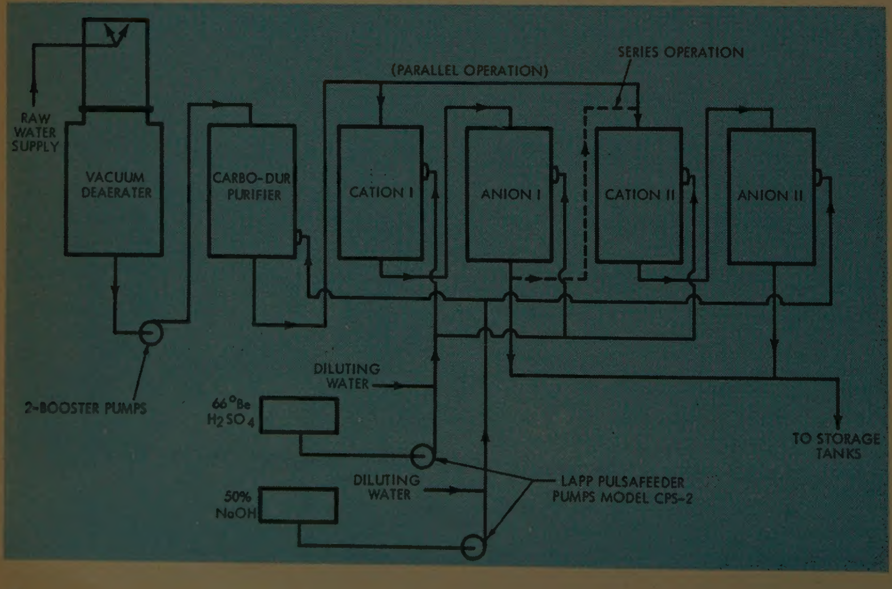
The company wanted to eliminate these difficulties in the station, and the Permutit Company, a division of Pfaudler-Permutit, Inc., collaborated in specifying ion exchange equipment. A decision was made to use as feed equipment a machine that was originally designed to meter "hard to handle" liquids for the chemical process industries. Called the Pulsafeeder, the machine features leak-proof design, inbuilt pressure relief valve, all working parts submerged in oil, and adjustment of flow while idle or operating.

A suitable variety of liquid handling designs and materials were devised by the Process Equipment Division of Lapp Insulator Company. Selected were two different types of Pulsafeeders; Models CPS-2, large capacity singleheaded units; and LS-10 units, for precise pumping of fluids at Micro-Flow rates.

The Pulsafeeder units combine features of both plunger and diaphragm pumps while eliminating the drawbacks of each. The chief disadvantage to conventional diaphragm pump for this application was the mechanical connection between reciprocating drive and diaphragm. Under flow variations this could cause non-uniform loading of the diaphragm with attendant deformation which would result in erratic pumping rates. The Pulsafeeder diaphragm, however, continues to have constant rate because it is hydraulically actuated and loading is uniform.

Plunger pumps have stuffing boxes that leak, require constant flushing, and usually require continual maintenance. In the Pulsafeeder, a piston in hydraulic oil actuates the diaphragm, thereby eliminating all stuffing boxes and packing glands. The pumps have no

Fig. 1—Flow chart of Rochester Gas & Electric Company's demineralizing system.



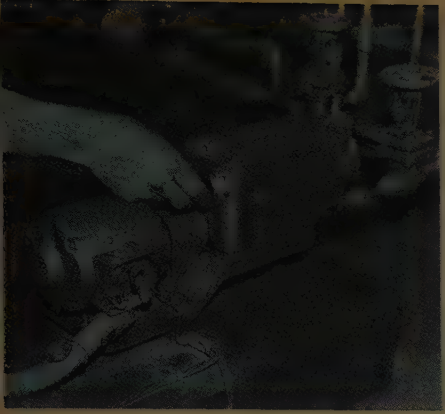


Fig. 3—Pumping rate of the Pulsafeeder LS-10 units is adjusted by turning a micrometer dial; adjustments can be made in increments of 1/1000th of max. output while operating or idle.

fluid or liquid seal, no flush steam, and therefore overcome leakage problems.

The reciprocating piston within the Pulsafeeder forces oil to move a diaphragm forward and to return. The back stroke takes the feed chemical into the reagent head through suction check valves. The liquid is forced through the discharge valve on the forward stroke. The diaphragm isolates the chemical being pumped within the reagent head plate and check valve. Because of this, no other parts need be made of a chemically stable material. The piston handles only oil; if a leak exists, the oil is automatically replaced by a vacuum compensator valve.

The CPS-2 units are used in the regeneration of the cation and anion exchanger units on the demineralizer. One pumps 93 percent sulfuric acid from its storage tank to a mixing chamber where it is diluted. Another CPS-2 is used to pump 50 percent caustic solution (NaOH) from the storage tank to an automatic mixing valve.

Basic Cycles

Like all demineralizers, Rochester's system accomplished these basic cycles of cation and anion removal: (1) the *service run* during which the water flows through the bed of ion exchanger; (2) *backwashing* for removing suspended solids filtered out by the ion exchanger; (3) *regenerant introduction* which restores the capacity of the ion exchanger; and (4) *rinsing* which removes the excess regenerant from the bed.

The ion exchangers are solids which can take a "charge" of cations or anions from one liquid and exchange them for different ions at the same polarity in another liquid. For instance, a sulfonated polystyrene cation resin picks up calcium, magnesium, sodium, iron, manganese, or aluminum cations from raw water containing these materials, and gives off hydrogen cations in exchange. When exhausted, the resin is regenerated with an acid solution that supplies new hydrogen cations. The regeneration is simply a reversal of the exchange process essential to renew the capacity of a resin so that it can again absorb ions of cationic or anionic minerals to produce mineral-free water.

High quality water is vital for the efficient operation of the boiler which operates at 1800 psi, 1055F main steam temperature and 1055F reheat temperature.

Parts Materials

The Pulsafeeder CPS-2 handling 66-deg BeH$_2$SO$_4$ has a maximum flow of 42 gph and an operating pressure of 150 psig. Liquid handling parts were selected for superior resistance to the chemical metered. The reagent head material and valve housing is stainless steel 316; the ball valve is of Hastelloy C; the valve seat material is of Carpenter Stainless No. 20. The diaphragm is of Teflon plastic.

A totally enclosed "power house" insulated motor resists attack from any chemicals that might be present in the atmosphere. The ½ hp motor switches from 865 to 1725 rpm during the regenerating operation. It is a three-phase, 440-volt, 60-cycle ac motor operating the pump at 58-29 strokes per minute.

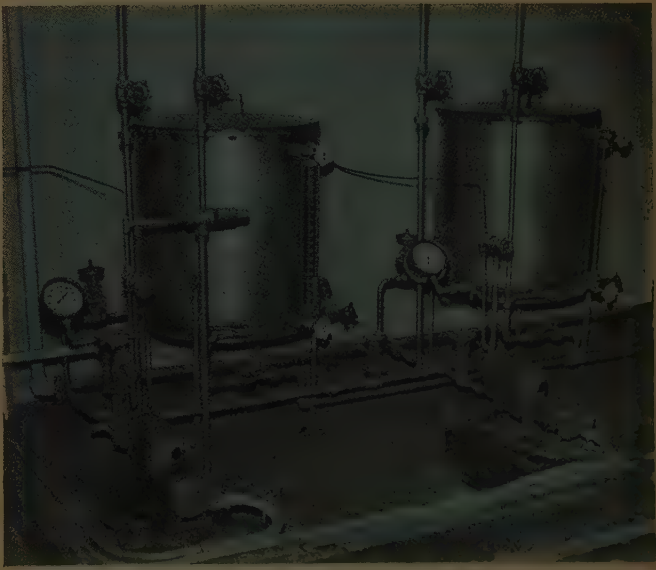
The CPS-2 unit feeding 50 percent NaOH has a maximum flow of 42 gph and an operating pressure of 150 psig. Its reagent head materials are similar, except the diaphragm is of Hycar, the ball valve is of stainless 18-8, and the seat material is stainless 316. The pump operates at 66 strokes per minute driven by a single speed 1725 rpm motor.

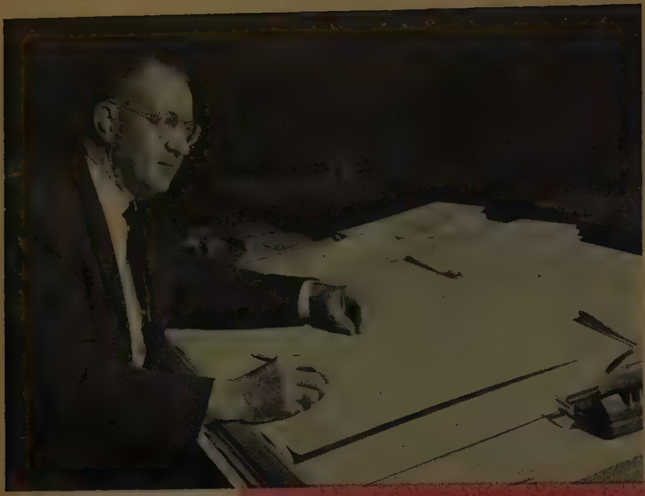
The LS-10 units are used to pump dilute solutions of hydrazine and morpholine into the condensate header. Hydrazine is added to scavenge the oxygen and morpholine is added for pH control. The LS-10's have proven ideal for pumping of the volatile hydrazine. The units originally were designed for research and pilot operations where a pump is expected to maintain unvarying flow rates for many months at a time, handling conditions of pressure, temperature and corrosion more severe than normal, and at a very low flow rate. The LS-10's pump 2260 ml/h at 1000 psig. The reagent head materials are of stainless steel AISI grade 304. A 1725 rpm, 1/20 hp, 115-volt, 60-cycle, single-phase a-c motor powers these pumps.

Economics of scavenging trace quantities of oxygen with hydrazine is reported to compare favorably with sulfite injection. Hydrazine has the advantage of leaving no residue, since the end-products are water

(Continued on page 87)

Fig. 2—Pulsafeeder LS-10 units used to pump dilute solutions of hydrazine and morpholine into feed water system; unit on left pumps hydrazine used to scavenge oxygen; pump on right meters morpholine used for pH control.





Mechanical engineering head, David Kvapil, makes revisions in drawing scheduled for microfilming.

Microfilming CUTS FILE SPACE, ADDS SECURITY

Quickly made, low-cost miniature records on films cut storage requirements, preserve original drawings, provide security of duplication, help retain sequence of revisions.

(See Dec. 1 EL&P, page 43)

Among electric-utility companies in the nation, Iowa Electric Light and Power Company has been one of the leaders in the use of microfilm for its engineering drawings and records. Its two units, a large C-3 model and a smaller Recordak Reliant Model RM, are kept constantly busy recording drawings and records not only for the engineering department but for accounting records, books, ledgers, stockholder reports and contract files.

In all cases, the original materials from which the microfilms were made are still accessible but the company is anticipating a time when the originals can be moved from its main offices to less expensive storage in its warehouse. Desk space is at a premium in the engineering department and microfilm is enabling engineers to consolidate their maps and records into a fraction of the file space they now consume.

Over 16,000 maps and drawings have been microfilmed in the past two years and are contained in four 7½ in. x 3½-in. file drawers. This represents approximately 80 percent of the drawings on file in the department.

As original drawings are transferred by the Recordak process to 35mm film, they are mounted on small EAM file cards which are keypunched for machine sorting. These cards are filed by number with the number of the drawings and the company's name on the top of the card. A master list of drawings and their assigned numbers enables engineers to readily find the drawing they want. Although the company has the equipment available for IBM machine sorting, they have not, as yet, made such extensive use of the microfilm records as to need it.

Company assistant secretary, Steven Smith, estimates that thousands of man-hours of work are represented in the drawings and stressed the "security value" of the microfilm process.

"When we microfilm drawings or records," Smith said, "we have an

Operator Lorraine Yoch prepares drawing for photographing on the 35mm C-3 machine.

extra print film made which we keep in the bank vault in case of lost or damaged originals."

David Kvapil, an executive in the mechanical engineering department and one of the main advocates of the Recordak system, anticipates the eventual disposal of many of the original tracings. "We've not yet used the microfilm as extensively as we plan to," Kvapil said, "because immediate work limits the amount of time we can devote to the files. We're getting well started on a microfilming program here; we've been at it a year and have forty years of records on film."

The ease of tracing the continuity of change in a drawing is another advantage of microfilm cited by the engineers. When an alteration is made in a drawing, it is made on the original, if possible, which is then rephotographed. A microfilm of the revision is then made and a notation of the date of the change is made on an IBM card. The original drawing and its subsequent revisions are then filed together.

Office records are reproduced at a 40:1 reduction on the 16mm Recordak model and the operator can prepare and film over a thousand uniform-size pieces an hour. One 100-foot roll of microfilm can contain over 10,000 documents.

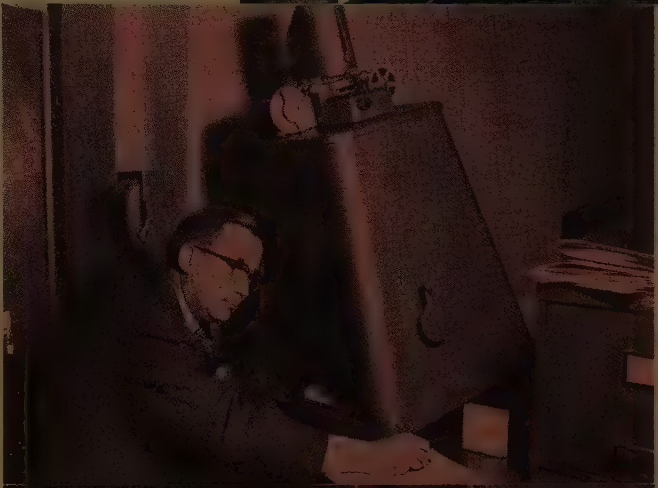
The economy of microfilming is another advantage of the process cited by Smith. The 35mm Recordak equipment gets 500 engineering drawings per roll of 35mm film, costing approximately $8.00 a roll.

Since the Iowa Electric Light and Power Company, unlike many other utility companies, does much of its own engineering, microfilm is especially valuable as an economical, space-conserving method of record keeping.

The company does not require more units or additional personnel to carry out the microfilming program at this time.

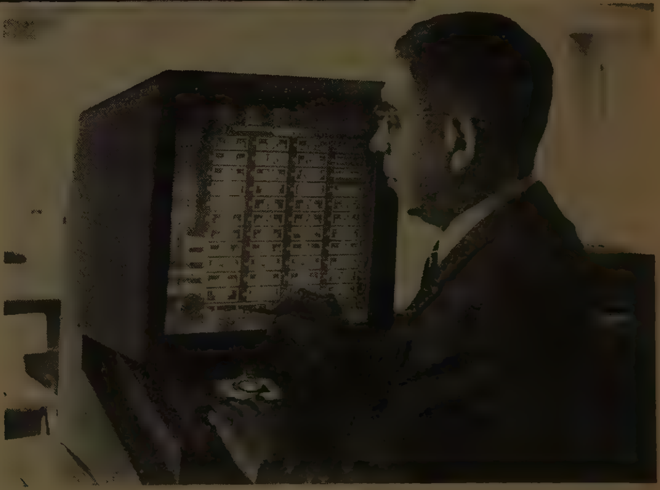
Smith and Kvapil were unanimous in their views that microfilm will find more and more use in not only the engineering department, but other departments as the company continues to grow.

Smaller records are microfilmed on the 16mm Model RM. →



Draftsman Donald Gott reviews information contained in 16mm microfilm by viewing it in reader. ←

← Assistant Secretary Steven Smith selects 35mm microfilm which is indexed and mounted on keypunched card for machine sorting.



Engineer Loren Frink views projection of 35mm film in the large reader. →

The book was thrown away to design the electrical-supply system for this twin 60-story circular-tower apartment project.

UNIQUE ELECTRICAL SUPPLY USED FOR MARINA CITY DEVELOPMENT

THE SALES DEPARTMENT at the Commonwealth Edison Company did an excellent job of promoting electric heat in the new Marina City high-rise, apartment-tower project in Chicago. However, to make the story complete, this project also promoted a few gray hairs for the engineers who had the job of providing distribution capacity for the tremendous loads of these all-electric buildings.

Tremendous Electrical Loads

At Marina City the most recent electrical item which the architect incorporated in his plans was 3000 kw for electric snow melting. This brings the connected load at Marina City to the very impressive figure of 40,000 kw. It is expected that the coincident demand corresponding to this load will be about 18,000 kva.

The very heavy load at Marina City has dictated an engineering design which is unique in the history of the Commonwealth Edison Co. and probably for the entire world.

When the engineering department at CE Co. was approached by sales to initiate an engineering design for the electrical supply to Marina City, it became immediately apparent that there were some very difficult engineering problems to be overcome. The foremost need was to establish a basic overall electrical plan for supplying the tremendous load to Marina City.

Marina City is located on the north bank of the Chicago River in the heart of CE Co.'s a-c network area. However, there are very serious difficulties associated with supply from the a-c network system. The usual approach for supplying high-rise buildings of this type from the a-c network system is to install network-type transformers in the basement (or in a street vault) to step down from 12,000 v to 480 v.

The 480-v cables would then be led up into the towers, and at the upper levels dry-type transformers would be installed to convert to the customer's service voltage. It was determined that if this plan were to be followed at Marina City, the heavy load due to electric heating (amounting to about 5000 kva for each tower) would require 42 single-conductor 500-MCM cables per tower. Actually, secondary bus duct would probably be installed in the cores of the towers instead of the 42 cables. However, these ducts are both bulky and expensive, and the architectural design of the core is too tight to tolerate such a layout.

A partial solution to this secondary problem might be obtained by installing some of the network vaults on the roof or on the upper floors. However, network vaults are large and any located on upper floors would have to displace a substantial amount of rentable apartment space. One can appreciate how little appeal such loss of revenue has for the promoter.

Then the problem evolves of how to replace network transformers on the upper floors in case of failure. The tower elevators are designed for passengers and not heavy freight. The capacity of these elevators is only 2500 lbs and the door opening is 3 ft-2 in. wide. By contrast, a 1500-kva, 12,000-v network transformer weighs 21,000 lbs—more than eight times the elevator capacity.

This is the artist's conception of the new Marina City all-electric apartment project that is being built in the Chicago-Loop Area. Photograph by Bill Engdahl, Hedrich-Blessing, Chicago.

Editors note: This is an adaption of a paper given at the Wisconsin Utility Association Meeting, October 19, 1961.

Status of construction on the Marina City project as of the second week in November, 1961.

Book Thrown Away

Thus, it was seen that with the very heavy load and unusual architectural features of Marina City there was only one thing to do—throw away the book and come up with a design tailor-made for Marina City.

Before describing the system that was designed for Marina City, it may be well to mention that when the CE Co. engineering departments got into the picture, the basic architectural details of Marina City were already finalized. So the sales-promotion men came to the engineering office one day, gathered some of the engineers around, threw a set of plans on the table and said, "Fellows, these plans show the space allocated to you for electrical vaults in the towers for supply to the apartments. You may find these vaults just a little bit tight, but you'll just have to get your equipment in there because it's too late to make changes now."

The description of these apartment vaults as "just a little bit tight" was undoubtedly the understatement of the year. These vaults are 4 ft deep, 6 ft wide and have 7.5 ft of headroom. Into this space, CE Co. would have to get a 200-kva transformer, 12-kv load-break-disconnect switches for both normal and emergency supply, a primary fuse, primary cables with suitable terminations, plus secondary service cables.

Broomcloset Vaults

The little group of engineers sat looking at the apartment-vault drawing with a mixture of disbelief and dismay for a considerable time. Finally, one of them found his voice sufficiently to say "You know, I'm convinced that these little rooms were originally intended to be broom closets and that the decision to use them as electrical vaults was purely an afterthought." Thus the expression "broomcloset vaults" was born and has been the title for these vaults around CE Co. ever since as it seemed to fit so well as a descriptive term.

The engineers managed not only to get all the required equipment into the vault, but also came up with an equipment arrangement which should be highly satisfactory from both an engineering and operating viewpoint.

Various other problems were encountered and solved during the planning of the electrical system at Marina City. Typical of these was the design of a suitable lightning-protection system for this unusual building and recommendations to the architect for a satisfactory secondary-grounding arrangement.

Electrical Supply System

The electrical supply for Marina City will originate at Kingsbury substation (69/12 kv), which is about two-thirds of a mile from the towers. Supply from the substation will consist of three 12-kv underground cables (consisting of three conductors each). Two cables will be supplied from CE Co.'s "red" system and one from the "blue" system, to provide diversity. The cables will terminate in a main switchroom at ground level near the Marina City buildings. This switchroom will be equipped with automatic circuit breakers so that a cable failure in the street should only cause a momentary interruption.

The main switchroom is the important control point for service to Marina City. This switchroom will be located on public property a few feet from the building. Each of the three incoming 12-kv lines will be equipped with an automatic circuit breaker and a 4th breaker will be provided for a future line. There will also be two bus-tie breakers.

The relaying will be arranged to inhibit closing of the bus-tie breakers under fault conditions where their closing would be undesirable. This situation would exist where the fault was on the bus or in the primary risers in the building.

From the main switchroom, six 12,000-v cables will be led up through the cores of the towers to provide a 12,000-v source for what are two basic types of vaults: community vaults and the building-service vaults. The most numerous of these vaults, and also the most interesting, are the small community or "broomcloset" vaults which will supply individually-metered service to the 896 apartments. The building-service vaults will provide service to elevators, corridor lighting and heating, the centralized laundry, and other building needs.

CE Co. engineers do not expect any trouble on the primary-cable risers within the building as they are in a dry location and completely protected from mechanical damage. But assuming there is a cable failure on one of the primary risers in the towers, provision has been made for restoring service to the apartments with only a very short interruption.

The broomcloset vaults will be located on all of the even-numbered floors from the 22nd to the 60th floor in each tower. Thus, there are 20 such vaults per tower, or a total of 40 vaults of this type in the project.

The major item of equipment in these vaults is the single-phase dry-type transformer, the primary of which is connected between phase and neutral of the 12,000-v cable. A fuse and load-break switch connects the transformer and normal supply feeder. In the event that the normal supply fails, the switches can be operated manually to transfer service to the emergency feeder.

There are 2 sets of 4-No. 2/0 single-conductor cables comprising the 12,000-v primary-cable system in each tower. Incidentally, the secondary services for the larger apartments are No. 2 copper.

Vaults Accessible To CE Co. Only

It might be well to mention at this point that all of the broomcloset vaults will be under lock and key, accessible only to CE Co. personnel. In the event of a failure of the normal supply in the vault, a CE Co. operator would be dispatched to do the necessary switching to restore service.

Model Apartment Built

A full-scale model apartment was built at the CE Co. Technical Center to study the heating problems associated with Marina City. Another prime function of this model was to test a full-scale prototype of the little broomcloset vaults.

Fig. 1 is a view taken in the Technical Center apartment-model looking down the corridor toward the small community vault, on which the louvered doors are partially open. The elevator doors can be seen on both sides of the corridor.

Fig. 1—View looking down corridor of full-scale model of Marina City apartment that was built at Commonwealth Edison Technical Center to study heating problems, etc. Broomcloset vault can be seen at the end of corridor (doors partly open).

The interior of the broomcloset vault is shown in Fig. 2. A CE Co. man is shown operating the normal supply switch with a hook stick. At the left of this switch is the emergency supply switch which is normally open. To the right of the switches is the primary fuse. Below the switches is the 200-kva dry-type transformer, which is one of the actual transformers which will be used at Marina City. All tests in the Tech-Center model were made "live" under actual load conditions.

Building-Service Vaults

There are a number of larger vaults which will supply the needs of building service in the tower and both community load and building service in the base structure.

One such building-service vault is located on the 59th and 60th floors of the towers. Although this is one vault electrically, half of the equipment had to be located on the 59th floor and half on the 60th. Space was always a problem at Marina City. This vault will supply such critical load as elevators, a substantial part of the corridor heating, ventilating fans, snow-melting equipment on the roof and an ice-melting device on the TV mast. Half of the elevators will be fed from each side of the secondary bus-tie.

Another building-service vault is located on the 19th floor in the garage area at the top of the spiral ramp. This vault will supply all of the water heating in the large centralized laundry on the 20th floor, as well as lighting for the upper 10 ramp floors and part of the corridor heating. The design of this vault is quite conventional using manually-operated load-break disconnects and a primary fuse.

On the 20th floor, there is a small broomcloset-type vault which is exactly the same as the ones described for supply to the apartments. However, this is a building-service vault to supply power for the appliances in the centralized laundry.

The largest transformer vault in the building is located in the base of the building at Marina level. This vault will supply building services in the base structure, such as heating and lighting of public areas and a substantial amount of community load, bowling alley, restaurant, theater, etc. Another major function of this vault will be to provide a supply for the office building which will be located on the north half of the project area.

It had been planned originally that this marina-level vault would be located in the building above grade using standard non-submersible transformers and switchgear. However, the architect was not able to provide space for this vault and

(Continued on page 73)

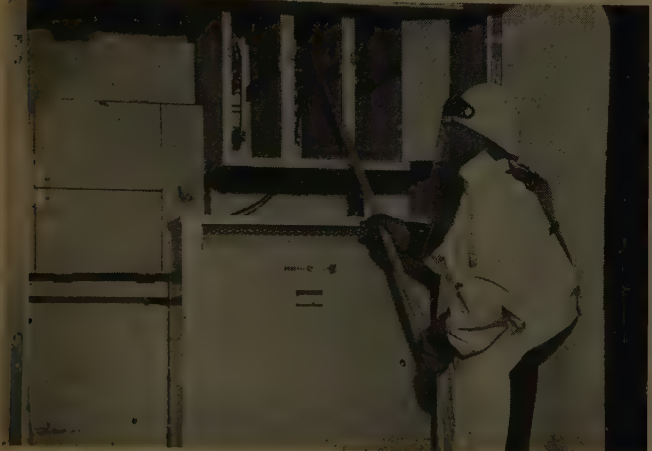
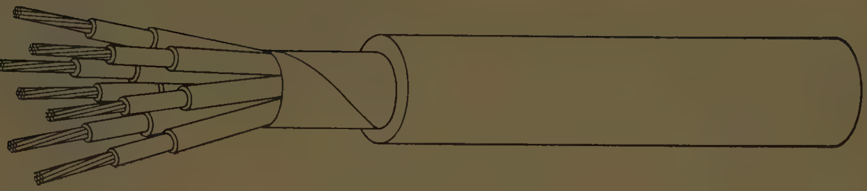


Fig. 2—This shows the interior of a broomcloset vault as built at Commonwealth Edison Technical Center. A CE Co. man is shown operating the normal supply switch with a hook stick. At the left of this switch is the emergency supply switch which is normally open.

Progress report from COLLYER . . .



Collyer C-143 Poly E/PVC CONTROL CABLE – another progressive contribution to BETTER CONTROL CABLE installations . . .

Here is why and how it will help you —

Quality throughout

Collyer C-143 Control Cable consists of copper conductors (solid or stranded, as specified) insulated with 20 mils of polyethylene and jacketed with PVC which is color coded. The insulated and jacketed conductors are twisted with fillers when required. The assembled conductors are taped with Mylar over which a PVC sheath is applied.

Moisture and ozone resistant

Environmental moisture is no problem to Collyer C-143 Control Cable because of the excellent moisture resisting properties of polyethylene. And Collyer C-143 Control Cable is ideal for use in atmospheres with heavy concentrations of ozone because ozone has no effect on this construction.

Individual PVC jackets

PVC, an important feature of Collyer C-143 Control Cable, is used as a conductor jacket to provide mechanical protection for the polyethylene insulation. PVC conductor jackets are of bright and permanent colors. The PVC jackets and sheath also provide flame retardant properties essential to vital control circuits.

Easy to install – easy to trace

Collyer C-143 is small in diameter . . . light in weight . . . economical to install. It's easy to strip and clean to handle. Brilliant color coding means quick, accurate and permanent circuit identification.

Excellent electrical properties

Collyer C-143 Control Cable is extremely durable. The high dielectric strength and excellent aging properties of the polyethylene assure the user that this cable will have long life. Because we use PVC conductor jackets for color coding, we are able to use polyethylene in an unblended form for insulation, thus providing the optimum electrical and physical properties of this material.

Modern design and cost

Collyer C-143 Control Cable takes advantage of the best and most modern materials and manufacturing techniques available today. As a user of this cable you get the happy combination of superior performance at lower cost.

For more information on this high-performance control cable, see your Collyer Distributor or Agent . . . or write for Catalog Section C-143 to COLLYER INSULATED WIRE CO., 263 Roosevelt Avenue, Pawtucket, Rhode Island.

Collyer Cables

INDUSTRY IN CONFERENCE

Endless Opportunities To Contribute To Better World, Chase Tells AIEE Members

We must put our brains to better work developing devices to aid people, using things for good purposes, direct our efforts in peaceful pursuits, yet conserve our resources, W. H. Chase, AIEE president, told the several hundred delegates attending the recent Fall General meeting of the Institute in Detroit. We should strive for better coordination between science and engineering, he said, work towards a more clear-cut image of the engineer and his role, and try to unify electrical people into one body for greater progress.

In order to contribute up to our full capabilities, declared George Gullen, director of labor relations, American Motors Corporation, we must first understand ourselves. The way to do that is to get away from the job, analyze ourselves, what we are, what we are a part of, and get a new perspective, he said. We are all children of God, he concluded; we have within us that which must come out and we don't become men until we stand up and say "this is what I have to offer."

Special recognition awards presented at the general session were: *Electrical engineering education* award to Prof. G. F. Corcoran, Chairman of Electrical Engineering, University of Maryland; *William F. Habirshaw* award to S. B. Griscom, advisory engineer, Electric Utility Engineering, Westinghouse Electric Corp.; *Morris E. Leeds* award to T. A. Rich, consulting engineer, General Engineering Laboratories, General Electric Co.; *Melvin J. Kelly* award to Harry Nyquist, retired Bell Telephone Laboratories engineer; and the *David Sarnoff* award to Prof. C. H. Townes, Columbia University, on leave serving with the U. S. Air Force Scientific Advisory Board.

Technical Sessions

Among the more interesting papers presented on generating subjects was one by F. M. Heck, Jr. and C. Morrison, The Potomac Edison Co., which develops a formula for breakeven cost of peaking capacity. Conclusions reached by the authors are that: 1. Effect of quite-high production cost of peaking energy is insignificant for a reasonable amount of peaking capacity; 2. Peaking capacity is economically more attractive if heat rate of new base load capacity shows only moderate improvement over existing average; 3. Peaking capacity is economically more attractive to systems having low average fuel price for conventional steam units.

Because the fuel cell is just as efficient in small sizes as in large ones, they may first be used in off-peak generator facilities and to supply low-voltage constant loads, according to J. D. Flynn, The Cincinnati Gas & Electric Co. Early applications may also find them supplying electricity to places too remote for power lines or gas mains, he said. Diminishing fossil fuel reserves will cause the fuel cell to become still more attractive and it is not inconceivable that fuel cells in every home may supplant central power stations, or they may be used in combination with nuclear reactors, he concluded.

EHV V-shape structures have certain advantages over the Portal-shape, according to L. H. J. Cook and B. Cooper, International Power and Engineering Consultants, Ltd., who recently staged comprehensive tests. These are: reduced fabrication costs and easier construction, less tower deflection and more stability under broken guy conditions, and greater security with four guys than two.

When advantage can be taken of strength of materials in transmission structures, stronger steels will produce lighter designs at lower cost, according to J. C. Pohlman, U. S. Steel Corp. Savings also result from omission of protective surface coating and future surface maintenance when using such steels as Cor-Ten, he said; several utilities are presently examining the economics of this philosophy. Among new industry developments noted

For notable contributions to five branches of electrical engineering these engineers received awards presented by AIEE President Chase, right seated, at the Institute's Fall General Meeting. They are: (left seated,) Dr. Nyquist; (standing from left) T. A. Rich, G. F. Corcoran, C. H. Townes, and S. B. Griscom.

General Chairman of the AIEE Fall General Meeting, W. H. Frank, left, discusses 50th anniversary of the Michigan Section with George Gullen, featured speaker, and Institute President Warren Chase.

by the speaker are: quenched and tempered alloy standard and wide-flange beams, channels and angles; square and rectangular hollow structural shapes.

Tower Footings

Discussing new types of footings for transmission line structures in the 230-245-kv range, F. W. Farr and A. A. Osipovich, Bonneville Power Administration, noted that the trend at BPA is away from concrete footings. Only one percent of new footings are concrete, while 15 percent are grillage, 11 percent rock, 58 percent plate type and the rest special types.

Tower foundations can be satisfactorily and economically anchored by the use of expansion-type anchors backfilled with power-tamped crushed stone, according to M. Markowsky and N. J. McMurtie, The Hydro-Electric Com. of Ontario, who reported results of field tests. Preloading to the design capacity of each anchor effectively eliminates initial creep, they contend, and ensures reliable high capacity anchorage with acceptable limitation of uplift movement.

J. C. Engimann and W. J. Fern, Commonwealth Edison Co., reported successful use of concrete caisson type anchors in wet non-cohesive soils. Where clay was present at a reasonable depth caissons were belled in the clay. Where there was no clay, footings were installed in the non-cohesive soil by displacement of bentonite slurry with tremie poured concrete. The latter method was limited to lightly loaded suspension and small angle towers because no undercutting was done. Tests with bottoms undercut were successful in one location and partially successful in another.

Upgrading Existing Lines

Reporting results of a survey covering 56 companies that have increased voltage in some 90 transmission lines, R. H. Cumming, New England Electric System, noted that the major reasons for raising voltage were to remove capability limitations due to voltage drop and to make economic reduction of I^2R losses. A few indicated voltage increase to match neighboring systems for interconnection purposes. Extending useful life of an existing line by raising voltage may be the most economical choice, the speaker concluded from the study, especially if it can be done with little or no structural changes. Designing new lines with conversion in mind should be considered, he said, if conversion can be obtained at moderate cost. He suggested also that perhaps greater use could be made of wood, fiberglass and porcelain strut insulation than reported in the survey.

Surface fretting between conductor strands and support hardware reduces fatigue strength below that of unfretted wires by a factor of about 0.6, according to W. G. Fricke, Jr., and C. B. Rawlins, Alcoa, and plays an important part in occurrence of fatigue failures resulting from aeolian vibration. Some surface coatings reduce effects of fretting, they contend, but permanence of such coatings has not yet been determined.

A study of radio influence on a 70-mile 345-kv bundle-conductor line of Ohio Edison system led R. E. Graham and C. R. Bond to conclude that: 1. Corona rings have little or no effect on RI and will not be used on future lines of the same design; 2. Foul weather occurs less than 1.5 percent of the time in the OE service area and should not be considered a principle factor in line design; 3. The conductor is the major cause of RI in foul weather and probably is the primary cause in fair weather; 4. Readings at one site are not materially affected by precipitation on the line some five miles away; 5. Night tests and photographs proved valuable.

One Shareholder For Every Ten Customers Revealed At WUA Meeting

Martin E. Juhl, president of Wisconsin Utilities Association and president of Lake Superior District Power Co., commented, at WUA meeting Oct. 18-19 in Milwaukee, on the accomplishments of investor-owned utilities in Wisconsin by giving statistics of their growth during the past decade. He stated that natural gas consumption increased 344 percent and number of gas customers increased 32 percent over the past ten years; electric consumption increased 108 percent (more than doubled) and number of electric customers increased 26 percent. Juhl predicted that the rate of increased growth will be greater during the next decade for the investor-owned utilities in Wisconsin.

Pooling of generating facilities (EL&P 4/15/61—p. 50) and cooperating with the Edison Electric Institute in studies concerning a super-grid system for the entire nation are two definite plans that the electric utilities in Wisconsin will use to meet anticipated demands.

Investors Not "Fat Cats"

The total investment in Wisconsin's investor-owned utilities, using net plant figures, is almost $1-billion, according to Juhl. He said that there were more than 169,000 share owners (129,000 owners of common stock and 40,000 owners of preferred stock) of Wisconsin utility stock at the end of last year. These companies had a total of 1,647,000 customers. Dividing the number of customers by the number of shareholders shows that there is **one shareholder for every**

ten customers. Juhl reported that most of the stockholders are women who own less than 200 shares. The investors are not the so-called "fat cats" that some politicians and others try to picture them.

Political Climate

The pendulum of economic thinking is beginning to swing away from the era of the "great illusions" and we are approaching a period of hard-headed and tough-minded realism, Juhl stated. He believes that people are beginning to question concepts which have had too general acceptance in the past, they are tired of believing that Russians can be talked out of their conviction that they are going to dominate the world, people are tired of trying to find new caves in which to hide surplus foods and they are questioning the wisdom of our give-away programs.

This trend toward better appreciation of fundamentals applies to the utility business also, according to Juhl—the glamour is falling from TVA. People are coming to recognize that **there is no magic by which the government can generate and distribute electricity more efficiently and at a lower cost than investor-owned utilities,** even with tax concessions and two percent money.

Recommends "Enlightened" Participation

In the what-should-be-done category, Juhl encouraged all employees of the investor-owned utilities to become "enlightened" participants in the affairs of the political party of their choice. He suggested using employee information and educational programs as a good starting point.

Recovery Voltages

Some fundamental properties of recovery voltages in different kinds of switching problems were described by Joseph W. Rittenhouse, Technical Director, Hi-Voltage Equipment Co. He pointed out the differences in voltage conditions to which load-interrupter equipment might be subjected and illustrated that the ability of a switch to interrupt a flow of power is as much a function of the circuit as it is a function of the design of the switch itself. He explained that the difficulty of achieving successful interruption of capacitive circuits is not the dominant problem in capacitor switching but the initial interruption is too often followed by a restrike as the total recovery voltage approaches its peak.

Pathfinder Plant 85% Complete

E. C. Ward, Nuclear Engineer, Northern States Power Co., reported on the status of the Pathfinder Atomic Power Plant. He stated that it is about 85 percent complete and is scheduled for operation in mid-1962. Ward pointed out that this atomic plant, with an electrical output of 62 mw, will incorporate a boiling water reactor with the industry's first nuclear superheater. Testing of some systems is underway and fuel loading is scheduled for June 1962, according to Ward.

Chicago's Marina City

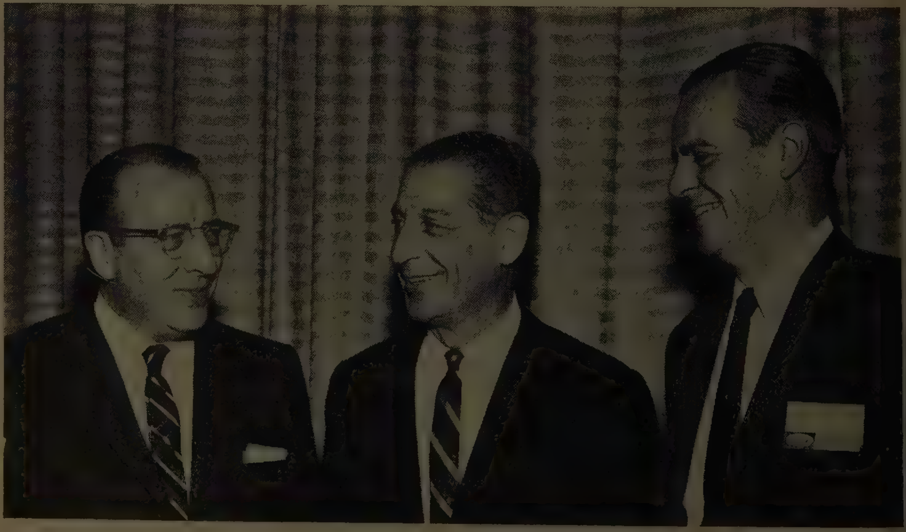
A new concept in central-city living, Marina City, was presented by Jack Leach and Ed Curtin of the Commonwealth Edison Co. Some of the electrical-design problems and solutions for this high-rise all-electric project in downtown Chicago is given feature presentation in this issue of Electric Light and Power.

Revolution On The Farm

F. W. Duffee, Chairman, Department of Agricultural Engineering, University of Wisconsin, revealed some very interesting statistics on the operation of farms in Wisconsin. Average production of corn per acre has increased 82%, wheat 54%, and cows give 61% more milk today than in 1910. Summarizing these facts he said a farm-worker could supply enough food and fibre for himself and 6 others in 1910; he could supply himself and 25 others in 1960.

Wisconsin farmers, who are predominately dairy farmers, have been helped considerably by the establishment of the Wisconsin Electric Research Farm — **with the very fine support of the Wisconsin Utilities Association.** The research farm has a 24-cow dairy herd. It has a 140-kw connected load and yearly usage of 60,000 to 70,000 kwh — or nearly ten times the average farm usage. A movie of the farm was made in 1955 and 36 prints of it have been distributed, two of these prints were sent to Europe. A bulletin entitled "Large Stall Barns With Milking Parlors" was published in the spring of 1961 from findings at the research farm.

Two U. S. Dept. of Commerce officials were hosts in Washington, D. C. recently at an all-day conference with editors and publishers of national business magazines. Below, Thomas E. Drumm, Jr., administrator of the Business and Defense Services Administration and Under Secretary of Commerce Edward Gudeman, are shown with Marshall Haywood, Jr., president of Haywood Publishing Company (publishers of ELECTRIC LIGHT and POWER and other business magazines). Mr. Haywood is also board chairman of National Business Publications, Inc., a Washington-based association of the publishing industry. In the conference, representatives of more than 80 NBP-member publications, as well as allied interest organizations, were brought up to date on the broad scope of operations of Commerce Dept. in the U. S. and abroad.



Reflection from AIF-ANS Nuclear Conferences:

Progress Toward Economic Atomic Power Mirrors A New Upswing of Optimism

An upswing in progress toward economic nuclear power seemed to be reflected at a nuclear meeting last month—the first significant measure of optimism for the industry's future exhibited since the early blush left the peacetime atom's image several years ago.

"Nuclear Week" in Chicago attracted record numbers of participants for the conferences of the Atomic Industrial Forum, and the American Nuclear Society, the Atom Fair '61 and the electric utility industry-sponsored National Youth Conference on the Atom.

For the first time, large-scale nuclear powerplant operating results could be reported, and considerable enthusiasm appeared to result from the stimulus of successful performance at Dresden and Yankee. (Argonne National Laboratory's recently retired director, Dr. Norman Hilberry observed: "You could feel the level of enthusiasm rise after the Dresden and Yankee reports . . ." His own appraisal: "We're over the hump" . . . but, to achieve success as an industry, we still need to exploit the old trick of profit-making—we've got to make the waste byproducts pay off. His advice: You can fit a well-designed fuel-cycle to reactors more readily than you can design a fuel-cycle to accommodate reactors of arbitrary design.)

(See insert below for more on Dresden and Yankee; for experience reports on these and other pioneer power reactor projects, see EL&P, Nov. 1, 1961.)

As Yankee's Roger J. Coe put it: "The favorable experience with Yankee indicates to us that nuclear power will move forward in New England . . . and it seems likely that Yankee's sponsors will be embarking on the construction of nuclear

---

Building Atomic Power Plants: Who Should "Call the Shots"?

At this early stage in the nuclear power age, one prominent question still unanswered is: what should be the contractual relations between the owner-operators and their chief suppliers, the designer-builders? Differing views on this key point were expressed by representatives of the first utility organizations to build and operate nuclear power plants who contributed "first experience" descriptions to EL&P's "Nuclear Progress Report" in the Nov. 1, 1961 issue.

In the progress reports on the Dresden and Yankee plants for the recent AIF-ANS conference, these two viewpoints were in sharp contrast—

YANKEE's Roger J. Coe said:

"We are not in favor of the turnkey idea, and believe the best results are attained if the owner 'calls the shots' and the contractural arrangements are similar to those normally employed by utilities in the construction of conventional plants. Particularly important is the idea of the owner being responsible for plant start-up, even though it requires early selection and training of operators."

"Dresden stands today as a milestone in the history of large nuclear power plants—a history we believe is just beginning . . ."

DRESDEN's Murray Joslin said:

"We consider our primary business to be in the production, distribution and sale of electric energy. We avoid engaging in the design of apparatus, and look to our manufacturers to develop the equipment we need. In this instance, a nuclear power plant, we consider the equipment required to be nothing short of the total plant . . . and we considered General Electric to be a responsible organization with the technical competence to deliver a successful plant."

"Yankee's sponsors, either single or in groups, will likely be embarking on construction of nuclear plants before too long . . ." (Among its sponsors, shown above at recent Yankee open house event, are Sherman R. Knapp, president of Connecticut Light & Power Co.; Chas Keenan, vice-president of Yankee Atomic Elect. Co.; Wm. J. Cooper, president of United Illum. Co.; A. D. Barney, chairman of Hartford El. Lght. Co.)

National Youth Conference on the Atom, sponsored by about 60 investor-owned electric utility companies from at least 26 states, attracted more than 500 outstanding high school students and teachers last month. In the photo at left above, meeting with a midwest delegation, are Interstate Power Co.'s advertising and PR manager, Mead Schenck (at left) and Pres. Milton Kapp (center), who was general chairman of the conference. In the photo at right, a youth contingent is shown on a visit to the ConEdison model of the Indian Point plant exhibited in the Babcock & Wilcox booth at the Atom Fair. At right is ConEd's V-P James Fairman.

plants before too long." And, Commonwealth Edison's Murray Joslin concluded: "Dresden today stands as a milestone in the history of large nuclear power plants—*a history which we believe is just beginning.*"

A fair amount of encouragement came, too, from the AEC Chairman, Dr. Glenn T. Seaborg. In his address for the combined AIF-ANS, Dr. Seaborg devoted quite a bit of attention to discussing the proposal for eventually converting to private ownership "under which reactor fuel and reactor products take their place as normal items of commerce in a free and competitive market." (As an example of the contemplated transition from government to industry, he noted in a press conference that "in general, we feel that the boiling water concept is far enough along so that industry can now take care of its development.")

In his prepared remarks, Dr. Seaborg developed these thoughts:

"Economic nuclear power and a flourishing industry based upon that accomplishment can only be achieved to the extent we have vision, strength, and determination. The reasons for pursuing the objective often become clouded by extraneous issues, and emotions. Technology and intelligent planning should guide our thinking. If we persevere, if industry practices what it preaches, if government stays the servant not the master, then, in spite of minor diversions, we will continue to make progress toward our goal—unleashing the power of the atom to the benefit of all mankind.

"It behooves us to speed developments which will make nuclear power cheap enough so that it can be selected over the power processes which utilize other valuable and versatile materials and thus hasten the day when we can realize the many benefits which will undoubtedly be derived from a future national fuels policy.

"We have made such strides toward our goal—a short-range program for making large nuclear plants competitive with fossil plants in high fuel cost areas by 1968; the longer range program of ever broadening the areas of the country which could benefit from nuclear power—that I am confident we have already developed the technology to meet it. Plants now on the drawing board appear capable of producing power from later cores, if not the first, which will be competitive in high fuel cost areas such as California and New England.

"But, this is not enough. One or two plants in widely dispersed areas of the country will certainly not represent an important contribution of nuclear energy to civilian uses. As I mentioned earlier, we want to see nuclear electric plants in all areas of the country—we want nuclear energy to play a major role in the thinking of utility management, both public and private, of the future.

"This can, and will, be done by continued development of new and improved reactor concepts, by engineering improvements in currently used concepts, by standardization of nuclear components, by decreasing costs of fuel fabrication, chemical processing, waste disposal, transportation, etc., by increasing efficiency of fuel usage as well as of operation and maintenance procedures, by developing systems which are capable of efficient breeding, and by the effects of mass production which will be felt when a true nuclear utility industry develops.

"I hope, and have reason to expect, that industry will take the principal steps necessary to bring about the commercial scale reactor plant construction needed to convert technological feasibility and extrapolated economics to firm factual technical engineering en econnomic data which will convince utility executives that nuclear plants can complete. However, if the entire burden for this crucial proof phase of the nuclear power program is left solely as an industrial effort, the timing of its accomplishment may not be consistent with our objectives.

"New plans which might envision more extensive government assistance to power reactor construction do not appear feasible at this time," the AEC Chairman indicated. "Nevertheless, we should do everything possible, within the scope of our current authority, to assure that commercial power reactors of the

(Continued on page 84)

MANAGEMENT-MARKETING

Industry Expansion Tip

Promote Area Growth From Within — Fulton

In the area development efforts of the electric power companies, all too few utility companies are devoting enough time to promoting growth by developing from within . . . and there is an "atrocious" absence of encouragement of new, incubating firms, services, tourism, recreation, agriculture, or wholesale, retail activities.

This outsider's impression — expressed to the EEI Area Development Conference last month by Maurice Fulton of the Fantus Factory Locating Service — recalls a number of notable exceptions where utility companies are in fact performing quite effectively, contrary to this accusation. Yet, vulnerability of the utilities to the criticism generally will probably be acknowledged first by the area development specialists themselves . . . for certainly more can be done by most companies in these particular directions.

Commenting on what he saw as "gaps" in most programs, Mr. Fulton observed that there appears to be little difference in the broad approach of the utilities, from one area to the other. Even those utilities which have the least probability of attracting new industry continue to devote their efforts toward attracting new industry, he noted.

Here are further impressions discussed by Mr. Fulton:

"The role of this department in any given company depends to a great extent upon management's philosophy of the importance of the function, the existence of other agencies in the same area, budgetary considerations, manpower availability, and overall feasibility in view of the territory involved.

"We see very few utilities participating, in any kind of coordinating council which might devise and implement growth strategy for the economy of the region. Sometimes we come across conditions of conflict among the utilities and other development agencies within a state; the power company, railroads, state groups, state chamber of commerce all may have individual programs, but completely uncoordinated and, perhaps negating one another's efforts—at least not getting full horsepower out of the combined effort. What is needed in most states is a coordinated effort which prevents overlapping and wasteful — and confusing — activities."

Mr. Fulton suggested that, in area development advertising, little attempt is made to convey to specific types of prospects the special reasons why an area is well suited to growth, and almost no advertisers use the medium to provide reference data suitable for future use. Yet, as rare as is the direct, intelligent, specific, prompt response, it is still more common among utility representatives than among most other development groups, he conceded.

"We are in sympathy with a problem you have where you serve broad areas and many cities—especially if you are asked to make suggestions as to locations. But if we ask for suggestions we like to feel that some thought has been given to the specific needs of a prospect. Sometimes you may suggest 12 or 15 cities, suggesting that broad coverage is the intent rather than the most thought-out possibilities. It is amusing to see how many times a specific city may appear on a list of contenders, whatever the industry type might be. We recognize that you all have problem areas, problem cities, where you really are anxious to place a plant, for one reason or another. But it must be remembered that the careful observer is interested only in the suggestion of very few cities, those which can best meet a *particular* set of requirements.

"Where a prospect asks for cost estimates or other data of a specific nature, such request should be honored. Too frequently, a submittal does not contain specific wage surveys, water rates, and so on, but may say wage data and power data will be supplied on request. Some companies will not request a second round of information if enough data is not provided at the outset. An initial telephone call to the prospect will frequently determine whether specific cost data is called for.

"In order to be of greatest help, the utility must be highly alert to the locational needs of the industry group, and the firm within the group. The prospect needs someone who is interested in its problems, familiar with the area involved, and capable of speedily determining the feasibility of a 'fit'."

Mr. Fulton acknowledged that many of the points made in his appraisal of electric utility company activities apply with equal validity to other development groups. He concluded his observations this way:

"Among all agencies involved in this work, you are certainly in the most advantageous position to provide the kind of leadership for the organization of community development and the implementation of the programs developed by such groups. Because of this we like to work with utilities, especially because there appears to be a pretty good sense of objectivity about areas — you *are* prepared to point out the problems of an area — you *do* recognize the shortcomings and possible negatives of a city or a region you serve."

WEST PENN has in most instances been *only the catalyst* in the industrial development field . . . where progress has been possible only through the hard work of Western Pennyslvania communities, said West Penn Power Co.'s Pres. Streuby L. Drumm last month when he accepted an award from the Society of Industrial Realtors as "Western Pennsylvania's outstanding industrialist for 1961." He explained: "Our area development efforts are being oriented to the retention of our present industries and their expansions . . . in a better living climate through community betterment."

ONE
MILLION
IN
SERVICE!

FOLLOW THE LEADER

One million General Electric Magne-valve distribution arresters are providing reliable system protection for over 3000 General Electric customers. ■ Since its introduction in 1953, the Magne-valve arrester has led the field.* All attempts to duplicate its quality features and reliable performance acknowledge its foremost position in the industry. Watch General Electric for tomorrow's arrester leadership, too.

General Electric Company, Section
488-10, Schenectady 5, New York

Progress Is Our Most Important Product

GENERAL ELECTRIC

* FIRST valve arrester with • magnetic gap • small size • light weight • 100,000-amp discharge capability • greater thermal capacity

Get ready for winter now

with Bethlehem Strand

Service interruptions were frequent and costly in many areas last winter. Snow and ice, broken limbs, and falling trees caused great damage to conductors and messenger strands alike.

When you use tough, strong Bethlehem strand as a messenger, you'll keep outages to a minimum. Bethlehem strand has exactly the right properties:

1) *High tensile strength.* Bethlehem strand is made in five grades, through Extra High Strength, to take care of all strength requirements.

2) *Good fatigue properties.* Fatigue tests show that bethanized wire is second to none.

3) *High resistance to corrosion.* Bethlehem offers 4 weights of bethanized (electrolytically applied zinc) coatings, as well as Bethalume (hot-dipped, aluminum-coated) strand for use in highly industrialized locations.

For complete information, call the nearest Bethlehem sales office.

Steel

for Strength
... Economy
... Versatility

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
Export Sales: Bethlehem Steel Export Corporation Distributor: Joslyn Mfg. & Supply Co.

BETHLEHEM STEEL

BETHLEHEM STEEL

WASHINGTON OUTLOOK

BY RALPH ELLIOTT
WASHINGTON EDITOR

Whither The REA Program?

The federally-financed rural electrification program passed a noteworthy milestone recently when an Iowa co-op, in making a routine payment on its REA loan, pushed electric borrowers' total principal repayments to the government over the billion dollar mark – ahead of schedule. In addition, these borrowers of some $4 billion have paid the government nearly half a billion in interest, according to REA.

The significance of this achievement varies, of course, depending upon how the program is viewed. From one side of the fence the co-ops' repayment record is cited to emphasize that REA loans are in no way an expense. The program is lauded as an investment in rural well-being and greater productivity, and is called a shining example of real "free enterprise" at work.

From the other side, a different story. The program, it is pointed out, involves both calculable and hidden expenses to the taxpayers in the form of interest subsidy, tax exemption, and the fact that a great many co-ops, being "preference" groups, are usually up front in the line when subsidized federal power is handed out. Moreover, the co-ops get a lot of free engineering and other technical assistance from REA. Small wonder that they can make a go of it financially.

Then there are several shades of an often-heard argument which concedes that the program, in and of itself, is an expense; but which holds that such expense is offset by federal and local government income realized as a result of taxable wealth, both farm and non-farm, created by the program.

It seems to this writer that the record so far made by REA-financed electric co-ops, viewed from any angle, can be said to be a remarkable achievement in some respects. Primarily, the phenomenon of hundreds of rural groups, most of them initially with little or no experience in the field, developing and successfully operating nearly $4 billion worth of electric service systems in what are, for the most part, the most thinly populated areas of the country. And most of the first billion dollars of loan repayments, it might be noted, came from the co-ops who pioneered the program along a pretty rough road—subsidies notwithstanding.

Looking ahead, the passage of this billion-dollar milestone raises an important question: Where does the program go from here?

Already there are clear signs that some of the New Frontier helmsmen are pulling hard to change the course of REA-financed rural electrification. These officials, with the cooperation of certain elements in the co-ops' national association, appear to have launched a concerted drive to draw the rural groups collectively into the big league of the socialized power movement.

A substantial change in the picture came last May when REA Administrator Norman Clapp adopted the "third criterion" for making generation and transmission loans. This provides that such loans will be made if they are considered "necessary to protect the security and effectiveness of REA-financed systems." Its purpose, according to Clapp, is "to guarantee the cooperative device a permanent place in the American power industry." Previously, REA would make G&T loans only when they resulted in cost savings, or when adequate power was not otherwise available.

The new policy came into play in the approval last June of a $60 million G&T loan to an Indiana super co-op – the largest loan REA ever made. Part of the loan will finance a 198,000 kw steam plant. The third criterion was the major consideration in the approval last month of a $20 million G&T loan to an Alabama co-op federation.

Another policy change by Clapp will enable co-ops to extend REA financing to the purchase and installation of electric-powered equipment in factories and commercial establishments in their service areas, and thus "encourage new production and service businesses."

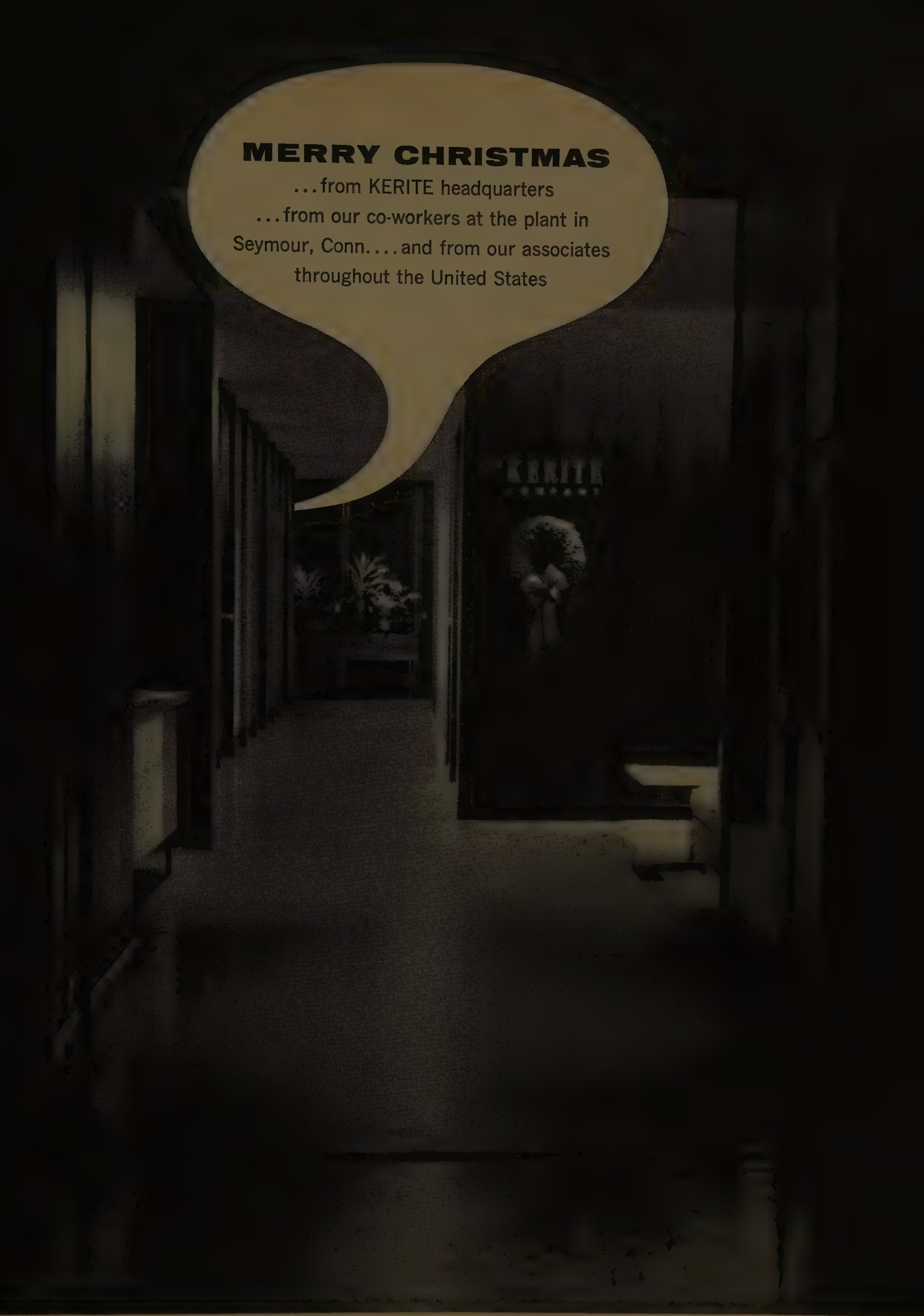
Other plans progressing under New Frontier policies include the use of 2% REA money to finance large thermal plants for firming up hydroelectric production on big federal systems. Such thermal plants to be located in the Missouri Basin and Upper Colorado areas are in the advanced planning stage. The most vocal advocate of integration of federal and co-op operations has been Interior Assistant Secretary Kenneth Holum, the department's top power man and former head of Mid-West Electric Consumers Association. At the regional NRECA meetings this fall he hotly preached the gospel of the giant grid, federal utility responsibility, and coordination of federal and co-op power operations.

Certainly it takes no great imagination to see the socialistic mischief portended by the public power slanted developments taking place in Washington. The REA program's intimacy with those developments and the apparent willingness of many co-ops to become enmeshed in the power nationalization scheme, gives cause to wonder just what the program will look like, if current trends continue, by the time the next billion dollars will have been repaid to the Treasury.

Unfortunately, the word "socialism" in our dangerously complacent and politically confused time, is too generally laughed off as just a scare word. So it may be worthwhile to recall some words attributed to two men about as politically far apart as you can get:

Said Norman Thomas, this country's foremost socialist: "The principle behind public development of power is socialistic and it is rather childish to deny it."

Admiral Ben Moreel, former chairman of Jones & Laughlin Steel, put it this way: "Whether the demagogues advocating public power are or are not socialists is not important. What is important is that the price we pay for public power must be measured by the advance of socialism in our midst and our concurrent loss of liberty."


MERRY CHRISTMAS
...from KERITE headquarters
...from our co-workers at the plant in Seymour, Conn.... and from our associates throughout the United States
KERITE

THE KERITE CO., 30 CHURCH ST., NEW YORK 7, N. Y. DESIGNERS AND MANUFACTURERS OF PREMIUM GRADE INSULATED WIRE AND CABLE, SPLICING TAPE, RUBBER CEMENT. AGENTS IN PRINCIPAL CITIES. A MEMBER OF RAILWAY PROGRESS INSTITUTE.

Ohio PUC Rules On Ohio Edison Company's Proposed Rate Increase To City Of Mansfield

1. **Edison's proposed rate increase cut 50%.**
2. **PUC reduces Company's rate base from $10,523 million to $9,222 million, or 12.3%.**
3. **Rate of return of 5.4% was allowed by PUC instead of 6.5% claimed by Company.**
4. **PUC rules on System Costs of City of Mansfield as well as costs within the city to classes of customers.**
5. **Ratepayers given benefits arising from temporary tax deferrals arising from use of Section 167.**
6. **Commissioner Kreuger dissents on giving deferred tax benefits to ratepayers.**

While the foregoing is a summary of the main points of the Ohio PUC decision with respect to the rate of return, rate base and the treatment of deferred taxes under Section 167, the real problem involved was the method of allocating the Company's rate base not only between the City of Mansfield and the rest of the Ohio Edison Company system, but also as between the classes of customers within that City.

"In order to test the reasonableness of the Ordinance rates that are the subject of this proceeding, the rate base must be allocated to the classes of service within the City of Mansfield that are covered by the Ordinance. In Company Exhibit 12, this was accompanied by allocating production, transmission and general plant first from system-wide totals to the City of Mansfield and then to the Ordinance classes involved in this proceeding. The distribution plant was allocated to the Ordinance classes from totals for the City of Mansfield. A variety of allocation ratios were used by the Company to apportion the various types and classes of property. These same allocation ratios were used by the Commission's Engineering Staff in allocating the lower rate base recommended by them for use in this proceeding.

"One apparent weakness in the Company's method involving the use of non-coincident demands of segments of the Company in the allocation procedure is that different results are obtained depending on the number of segments into which the Company is divided. . . .

". . . The primary weakness of the coincident demand method is that an allocation on the basis of load conditions as of a particular time might be inapplicable in the future if there is a shift of the system peak.

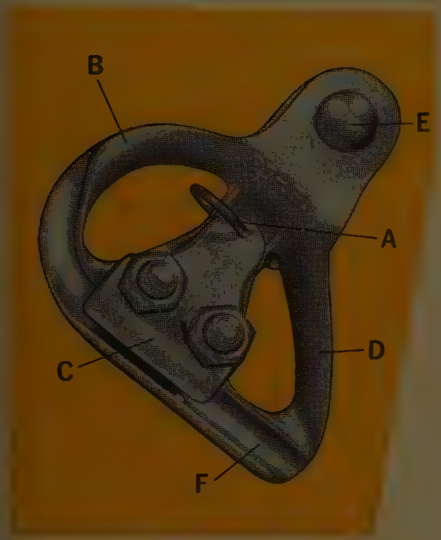
Capacity Costs Allocation

"The allocation of capacity costs of an integrated electric system has been a highly controversial subject for many years. One indication of this is that in 1955 the Cost Allocation Committee of the Engineering Committee of the NARUC published a document comparing 16 possible methods of allocating capacity costs of electric utilities without recommending any particular one as either the ideal or best method. (R. pp. 1134-35). Every method suggested thus far seems to be possessed of difficulties of one sort or another. We have carefully considered this problem and are of the opinion that the problem of allocating between classes of service differs significantly from that of allocating between geographical segments of the business of an electric utility where the particular geographical segment under consideration is a relatively small portion of the total. Thus, it is entirely possible that one method may be reasonable for allocation between classes of service and another more reasonable for allocation between geographical areas of this type. In the making of an allocation between classes of customers, the customer groups represent unambiguous, non-arbitrarily bounded segments of the business. Load factor differentials tend to be substantial and fairly persistent over time. In an allocation to a small geographical segment, the boundary must be to some degree arbitrary. Furthermore, load factor differentials between comparable geographical areas are likely to be relatively small. One method of allocation may therefore be reasonable in allocating between classes of customers and another in allocating between geographical areas.

"In the present case, the Commission is of the opinion that a more reasonable method of making the geographical allocation of capacity costs to the City of Mansfield is on the basis of energy actually used, i.e., on the basis of Kwh and Kva. This method avoids the necessity fo dividing the Company into an arbi trary number of geographical seg ments. Furthermore, since the basi figures entering into this type o allocation are metered, the problem of the use of estimates of unknow accuracy is avoided. Finally, thi method, if used consistently, woul have the effect of equalizing th capacity cost per unit of electricit to all of the geographical segment of the Company's business.

"The second step in the allocatio procedure involves allocation to th ordinance classes within the City c Mansfield. We are of the opinio that the average-excess deman method employed by both the Com pany and City witnesses is reason able in making the allocation be tween classes of service."

O-B Universal Strain Clamp, Number 88500. Range of conductor diameters, 0.20 to 0.50-inch. Ultimate strength, 10,000 pounds.

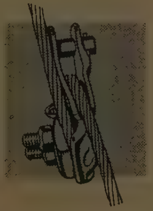


A. Spring-held keeperpiece. Stays positively open. Never dis-assembled. No loose pieces to handle or drop.

B. Snubbing action of clamp seat a major factor in high, slipless holding power.

C. Cable not crushed or deformed in clamp jaw. Gripped area may be relocated in span or jumper. Full strength and life of cable preserved.

D. Positive offset prevents chafing of cable where jumper loop crosses.



E. Hump-back, pointed cotter goes in and out easily with hot sticks but can't come loose.

F. Clamp brings cable into natural shape for jumper loop with minimum hand-forming.

MARINA CITY . . .

(Continued from page 48)

requested that it be located below the floor of the boat-storage area. This places the vault at an elevation subject to flooding and, therefore, it was necessary to make this a network-type vault using submersible equipment.

May Become Rule Rather Than Exception

The characteristics of this unique electric-supply system has significance at the present time because CE Co. expects to use the same type of system to supply electric heating in future high-rise apartment buildings in the Chicago-Loop area.

Because these buildings are located right in the heart of CE Co.'s a-c network area, it is reasonable to raise many questions as to how the 12-kv distribution method of supply at Marina City compares to service from the a-c network. There are two major comparisons to be considered —one being an economic comparison and the other from the viewpoint of service continuity.

To answer the economic questions, let's look at the results of a CE Co. study made comparing the two systems. This study consisted of an investigation of all of the pertinent costs involved in providing an electrical system to supply the entire load of a high-rise apartment building with 1000 electrically-heated apartments. Costs were determined, both for the CE Co. and the customer.

Results of the study revealed that the 12,000-v service would save Commonwealth Edison $234,000 over the 480-v a-c network supply.

Similarly, the customer would enjoy a saving of $149,000 over the system he would have to provide under the network plan. Part of the savings for CE Co. using the 12,000-v service is due to the complete elimination of network transformers in the basement. Another big cost item associated with this transformation is the capitalized cost of transformer losses.

The customer realizes his greatest savings from the fact that the service delivery points are located right at his load. The service-runs from transformers to the apartments at Marina City are only about 30 ft long. Contrast this with the 480-v network system where the 480-v supply originates in the basement. The customer must install expensive switchboards and bus duct to carry this 480-v supply to the upper levels. With the heavy loads associated with electric heating, this is no small item.

And what is the comparison with regard to service continuity on the two systems? A failure of 12-kv street cable, for example, gives a momentary interruption for the 12,000-v system as compared to none on the a-c network.

In case of a riser-cable failure, the 12,000-v service can be restored faster than the network type. With the 12,000-v system, the load-break disconnects in the vaults can be operated to transfer to the emergency supply. These switches are not provided on the conventional network system. A failure in a dry-type transformer requires replacement with either 12,000-v service or with the network system. Thus, the expected time of outage would be about the same in either case.

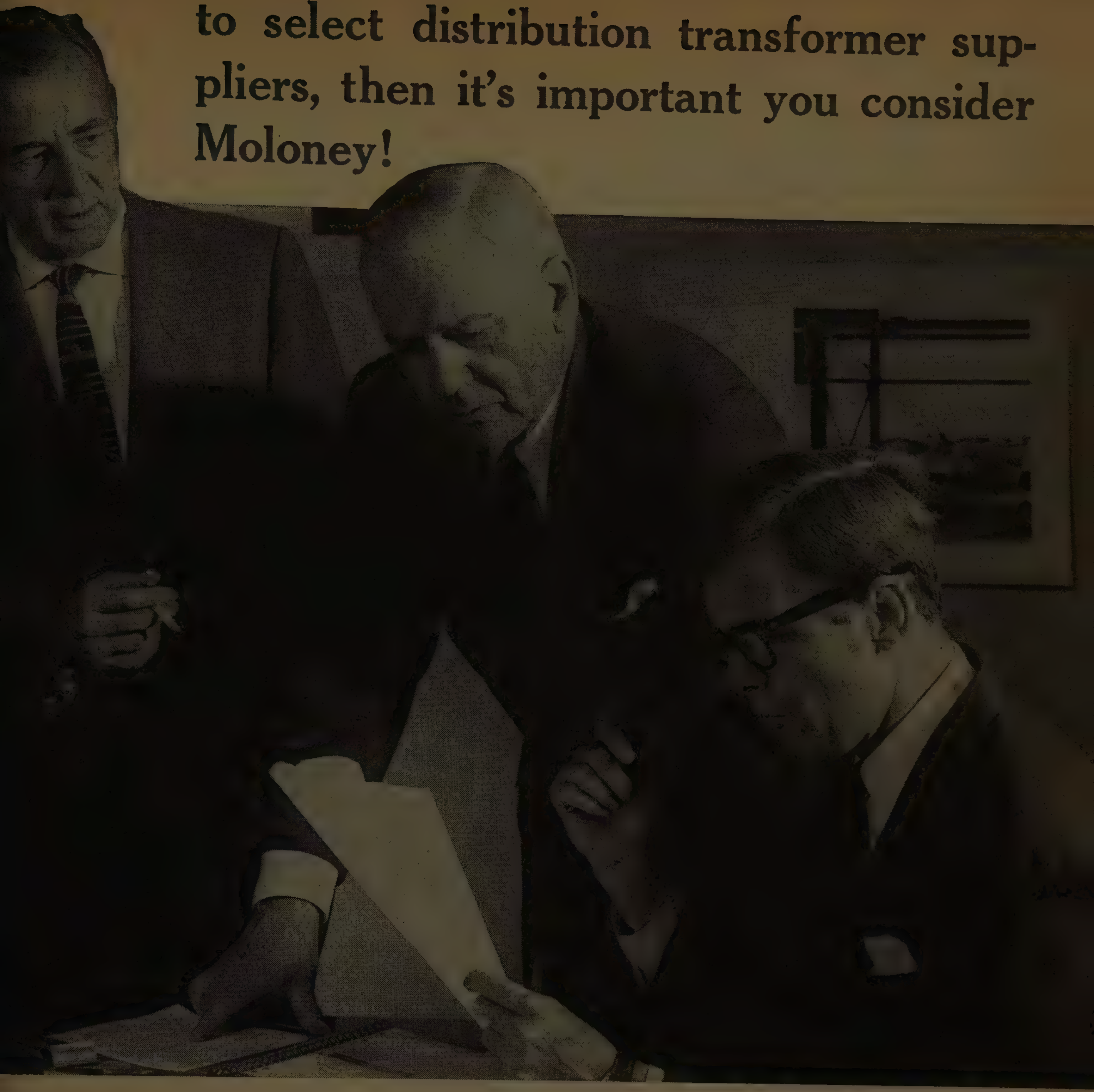
By now, it might be concluded that this concept of primary distribution within the building makes the a-c network system obsolete. This is not the case, since Commonwealth Edison expects that the network system will continue for many years in the future to be the dependable work-horse for service to downtown Chicago. However, the economics demonstrated proved that the 12,000-v system is a natural for high-rise buildings with electric heat, such as Marina City.

If it's your responsibility...

Why Moloney?

MOLONEY ELECTRIC COMPANY / *Manufacturers of Transformers and Switchgear for Utilities, Industry, and*

to select distribution transformer suppliers, then it's important you consider Moloney!



Because Moloney "Total Design" Transformers will give you efficient, customer satisfying performance.

Moloney's emphasis on "Total Design" transformer performance, so vital to your utility system, assures you that no one feature is stressed at the expense of another. Each new innovation must contribute to improvement in "Total Design".

For example, the thermal operating efficiency of Moloney Transformers has been substantiated by the AIEE-NEMA Life Tests, in which Moloney has participated since their inception. To further improve the "Total Design", Moloney developed Duratherm, one of three high temperature insulating papers presently available, which give still greater thermal capability.

Investigate the "Total Design" transformers and see what they offer for your system.

ME 61-25

NEW PRODUCT DESIGN

New Gauge for ASA Bushings

A new window-type sight gauge for determining oil level in the

Lapp POC and POC-A series of ASA Standard bushings rated 15-kv to 69-kv is announced by the **Lapp Insulator Co., Inc.** The new gauge replaces the dial-type, magnetic gauge on bushings in the lower voltage range where very high interrupting currents cause inaccuracies in magnetic gauges.

The new porthole gauges are now being supplied on Lapp-ASA Standard condenser bushings 15-kv to 69-kv. Magnetic type oil-level gauges using "cermet" ceramic permanent magnets will continue to be supplied on the higher voltage Standard bushings where short circuit currents are less severe.

Circle item #1 on reply card

Ultrasonic Generator

A 400-w ultrasonic generator with special feedback controls for high-speed cleaning has been introduced by the **Ultrasonic Power Division of Branson Instruments, Inc.** by automatically compensating for changes in temperature, load, and liquid level, the new Sonomatic A-400 generator always provides full power, thereby assuring maximum cleaning efficiency.

Heart of the new unit is a feedback control system. Unlike previous designs, the cleaning medium itself has been included in the feedback loop of the Branson system to make it more sensitive and accurate. Only one simple control is needed for operation at peak efficiency: an on/off switch.

Circle item #2 on reply card

Conduit Riser Adapter

New conduit riser adapter to aid in the extension of underground

secondary distribution systems is available from **Line Material Industries.** It provides a convenient means of terminating conduit in power pedestals for above-ground connection of secondary services to mains.

Prefabricated of bituminized fibre, the adapter assembly provides for leakproof junction of four two-inch conduit runs for secondary services, and two three-inch conduit runs for secondary main interconnection.

The adapter complements a complete line of L-M power pedestals to facilitate installation and expansion of secondary distribution systems. It is designed for use with standard type II (direct burial) fibre conduit and fittings.

Circle item #3 on reply card

Single-Tank 69-KV Power Breakers

What is said to be the electrical industry's first single-tank 69-kv

subtransmission oil circuit breaker has been introduced by **I-T-E Circuit Breaker Company's Power Circuit Breaker division.**

The new-design, compact unit incorporates the advanced Kool-Arc vertical interrupter for efficient, safe three-phase interruption in one tank. For utility and large industrial installations, it offers lower installation costs and substantial maintenance savings over conventional three-tank breakers of the same rating, says I-T-E.

Circle item #4 on reply card

Safety Lighting

A full line of safety lighting devices utilizing the wonders of man' newest light source, electroluminescence, has been developed by **Westinghouse and Solar Sonic Devices, Inc.**

The new line includes a step ligh for use on stair risers, walls, in

halls, vestibules, basement areas, nurseries, cloakrooms, hospital rooms, and closets. Also in the line is a weatherproof unit useful outdoors to identify walks, driveways, steps, house entrances, pool areas, and theater aisles.

Circle item #5 on reply card

Portable Oil Tester

A newly-designed portable oil tester, whose weight and over-all size have been reduced, it is reported, by more than 50 percent compared to previous models, has been introduced by the **General Electric Company.**

Weighing 42 pounds, the new unit is believed to be the lightest, truly portable oil tester presently available, according to engineers at the company's Specialty Transformer Department.

Circle item #6 on reply card

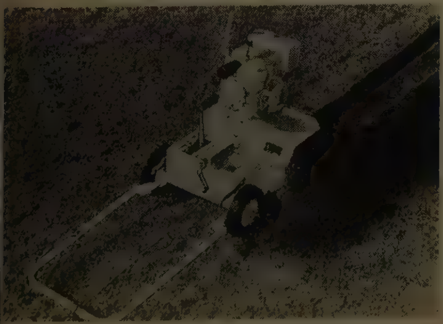
Utility Trencher

A new, compact utility trencher, the Davis W-36, which makes maximum use of horsepower without any manpower, has been introduced by **Davis Mfg. Inc.**

Powered by a heavy-duty six-hp Briggs & Stratton engine and self-propelled by a six-speed winch drive, the W-36 utilizes most of its power for digging with very little required for creeping along its winch line. The secret of its unusual digging ability is its lightweight design and positive propulsion.

The unit trenches from six-inches to three-inches wide to a maximum depth of 36-inches deep and will operate at speeds up to 500 ft per hour. It has a built-in protective torque limiter that disengages when a shock load is encountered, then re-engages immediately to continue digging.

Circle item #7 on reply card



Crapo
GALVANIZED
STEEL STRAND

Checked and Double-Checked by Laboratory Technicians

Every coil of wire used in the manufacture of *Crapo* Galvanized Steel Strand is tested and approved by trained laboratory technicians. Samples from both ends of each individual coil are subjected to a series of prescribed tests before stranding. Then, the finished strand is re-checked to make certain that it conforms in every respect to established specifications and our own high quality standards.

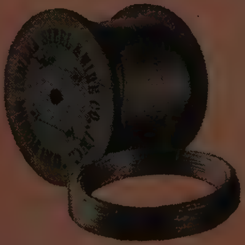
Thus you know when you specify *Crapo* Galvanized Strand that every precaution has been taken to assure maximum performance in the finished product.

Write for Free Booklet

"The Story Behind Crapo Galvanized Wire and Strand" illustrating and describing manufacturing techniques and testing procedures. Ask for Booklet B-59!

AVAILABLE IN 3 COATING WEIGHTS
FOR GUYS, MESSENGER AND OVERHEAD-GROUND WIRE

Crapo Steel Strand is available in all standard sizes and grades and in Class A, B and C galvanized coatings. Class B coating is twice as heavy as Class A coating; Class C coating is three times as heavy.



*Determines ductility of wire and adherent quality of galvanizing.

INDIANA STEEL & WIRE CO., INC.
Muncie, Indiana

Bashlin's Quality
FOR OVER 30 YEARS

TOOLS OF SAFETY . . .

BASHLIN Quality Body Belts with the additional Nylon Safety Feature . . . Work Safely . . . Comfortably . . . with tools in easy reach.

BASHLIN Quality Alcoa Aluminum Alloy Adjustable Climbers with replaceable gaffs . . . There is nothing better anywhere!

BASHLIN'S Nylon and leather Safety Straps . . . Bashlin Quality, of course.

You Can't Afford Anything LESS Than the BEST—
Buy BASHLIN
Highest Quality For Over 30 Years
Distributors in Strategic Areas in U.S.A.
EXPORT: Copperweld Steel International Co.
IN CANADA: A. B. Chance Co. of Canada, Ltd., Toronto

Ask for . . .
CATALOG NO. 456

W. M. BASHLIN CO.
GROVE CITY, PA.

MEN OF POWER

The board of directors of American Electric Power Company has elected **Donald C. Cook,** formerly a vice president, as president and chief executive officer of the company. He succeeds **Philip Sporn,** who has retired at age 65. Mr. Cook has been a vice president and a director of each of the AEP System's six operating utility companies, and a director of the Service Corporation.

Sporn

Cook

Simultaneously, the parent board established a new standing committee, the AEP System Development Committee, and appointed Mr. Sporn its chairman. In addition to his duties in this assignment, he will continue to serve as a director and member of the executive committee. He will also serve as advisor and consultant to the directors and officers of the company, in accordance with an arrangement entered into with the company in 1959.

In still another action, the Service directors elected **H. A. Kammer,** now executive vice president—engineering and construction, as senior vice president.

Mr. Sporn, internationally known electrical engineer, has been associated with American Electric Power since 1920 and has been president of the parent company and all of its subsidiaries since 1947.

* * *

Allan P. Good has been selected to succeed retiring **Walter A. McDonough** as vice president and controller of Northern Indiana Public Service Co. Mr. McDonough has more than 50 years of service in the public utility field. He will resign from the utility's Board of Directors. Mr. Good is a member of the National Society for Business Budgeting, and of the Accounting Committe of the Indiana Gas Association.

Also at NIPSCO, **James A. Farrell** has been elected assistant controller succeeding Mr. Good.

Elected vice president of public relations at NIPSCO is **James F. Purcell,** formerly public relations manager.

* * *

Named planning engineer—utility marketing by I-T-E Circuit Breaker Company is **"Can" Nordquist.** He has been associated with the sale and application of I-T-E products in the Chicago area for 33 years. He began there as field application engineer, later held the posts of assistant district manager and district manager. In 1956, he was named assistant Midwest regional manager.

* * *

Cheney

Three Pacific Gas and Electric Company executive appointments have been announced by the company. **Fran G. Rothganger** has been appointe manager of commercial, industria and agricultura sales by **Walter D. Howell,** who recently was made general sales manager. **William O. Cheney** has been appointed to succeed Mr. Rothganger as chief of the departmen of engineering research, headin the company's laboratory in Emeryville where materials qualit standards are established. **Gordo V. Richards** has been made supervising civil engineer at the laboratory.

* * *

A program to increase the application of computer technology fo engineering and operating purposes in Pacific Gas and Electri Co. was recently announced by th utility, along with the establishment of a new department of engineering computer application, and the appointment of **William M. Pickslay, Jr.**, as its chief.

* * *

Griffin

The Board of Director's of Public Service Company of Indiana, Inc. recently elected **Lloyd M. Griffin** vice president of the company. He will be in charge of the Company's Southern Division, with headquarters at Columbus.

Prior to joining Public Service Company, Mr. Griffin was manager, Special Projects Division, for Cummins Engine Company, Inc., Columbus, Indiana. He was previously employed in various engineering and management positions with Booz, Allen & Hamilton, Management Consultants, Chicago; American Welding & Manufacturing Co.; The Chesapeake & Ohio Railway Co., and Carnegie-Illinois Steel Co.

Street Light Control

Shrugs off Killing

Transient Voltages

How can a compact, lightweight photo control withstand the control-killing effect of a wide range of transient voltages?

Use Varistors to absorb surges which are below the spark-over of lightning arresters. Let the lightning arrester handle the higher transients.

That's the story on simple, reliable, surge tested LUMATROL MARK I*

Write for Bulletin 91a.

LUMATROL
MARK I

**Lumatrol Mark II, for 230 Volt circuits, is described in Bulletin 92.*

MICRO BALANCING, INC.
GARDEN CITY PARK, N.Y.
In Canada: J. R. KEARNEY CORP.
Box 270, Guelph, Ont.

Commonwealth Edison Company's board of directors recently elected **J. Harris Ward** to succeed **Willis Gale** as chairman. Mr. Gale will continue in active service with Commonwealth as chairman of the Executive Committee. The change in top executive alignment is in keeping with the company's management development philosophy.

Also at Commonwealth, **Nicholas Galitzine,** assistant to the chairman since 1950, has been elected a vice president of the utility. He has been with Commonwealth since 1923, serving in various sales and administrative capacities.

* * *

General Electric's Communication Products Department, Lynchburg, Va., has announced two executive changes. **William G. Chaney** has been appointed manager of Mobile Telephone Systems engineering, and Personal Communications engineering.

James E. Pitman has been named manager of Marketing Research and Planning. He was previously manager of product planning for point-to-point communication.

G.E.'s Instrument Department at Schenectady has realigned some functions of its Marketing Section to promote greater centralization in sales and product planning. **J. E. McQuillan** is named manager—Field Sales Operation. He was previously manager—Distributor and OEM Instrument Sales.

* * *

Carolina Power & Light Company has named Agricultural Development Engineer, **Donald S. Morris** to serve its Sanford District. He has been sales representative for CP&L in Asheboro since 1959.

J. D. Murphy has been appointed operations manager of the Kaiser Aluminum & Chemical Corp. wire and cable works in Bristol, R. I.

Charles V. Walker has been appointed advertising manager of Pennsylvania Transformer Division, McGraw-Edison Co.

The appointment of **Magnus C. Herder** as district manager of the Pittsburgh Office of Combustion Engineering, Inc. was recently announced.

Haley's

CEDAR POLES

and

FIR CROSS ARMS

Light in weight and clean. PENTAchlorophenol treated in our modern plant for protection against decay, moisture and insect damage.

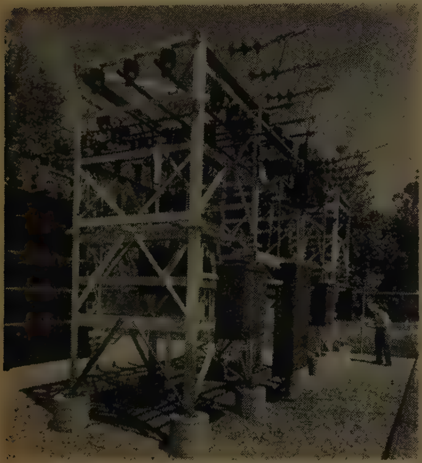
TWO strategically located yards:
MINNEAPOLIS, MINNESOTA
FINDLAY, OHIO

R. G. HALEY & CO.
SPITZER BLDG.
TOLEDO 4, OHIO

MANUFACTURERS DEVELOPMENTS

Recloser Feeder Structure Saves Time and Money

Three-packaged three-phase recloser feeder structures now in serv-



ice at the Mark Twain distribution substation of Union Electric Co. have provided marked installation economies for the utility. Installation time was reduced to about one hour, versus the two to three days required for alternate type of recloser installations. The installation cost was reduced by 75-percent, according to a recent announcement.

The recloser feeder structures manufactured by Westinghouse Electric Corporation are preassembled and wired at the factory and are shipped in two sections. The utility only needs to bolt the upper section to the lower section; then connect the transformer leads and incoming feeder lines.

B&W Recommends Universal Pressure Boilers For High Pressure Applications

The Universal Pressure once-through type boiler system will be recommended for all electric utility boiler applications requiring turbine throttle pressures of 2000 psi and higher, Babcock & Wilcox recently announced.

Establishment of such a policy is unique in the boiler industry because it literally endorses a single boiler design concept for application to electric power plants requiring steam pressure above the 2000 psi level at the turbine throttle.

The high-temperature, high-pressure boiler system developed by B&W has proved to be the most economical for these service conditions, the firm reports. In the past four years, 16 of the new units have been installed or ordered for utility plants.

Con Edison Orders Boiler To Power Huge Turbine

Consolidated Edison Company of New York has announced the awarding of a contract to build a mammoth steam generating boiler to power its record-breaking 1,000,000 kw turbine generator ordered last month from Allis-Chalmers Mfg. Co.

Combustion Engineering, Inc., who was awarded the contract, will design, manufacture and erect the steam boiler.

The huge boiler, comparable in size to a building 18 stories high, will be divided into two sections so that the electric generator unit can be operated at half power even though one section of the boiler is shut down. It will be designed to burn coal or oil.

When operated at peak load, about 350 tons of coal will be burned every hour. The unit will be capable of turning 6,500,000 pounds of water into high-pressure, high-temperature steam every hour.

* * *

Ground has been broken near the Toronto International Airport, Toronto, Canada, for the first two manufacturing units of a new plant to be built by S&C Electric Canada, Ltd. The new plant will manufacture high-voltage circuit interrupting equipment for electric utilities, industrial plants and large institutions.

N. J. Highway Dept. Tests Electric Roadway-Heating

An "under-actual-conditions" test site on one of its most heavily traveled truck routes is now being readied by the New Jersey State Highway Department for a winter-long official study on the feasibility of electrically heating road-way pavements to keep them free of ice and snow.

The procedure followed was to lay a 1½ in. bituminous concrete leveling course, position heat conducting cables, tack them to this base, place a sand mix black-top course to fill the area between cables, and machine-lay the final 1½ in. bituminous concrete surface

(Continued on page 83)

Scene of New Jersey highway test to determine feasibility of electrically heating roadway pavements is shown here. The entire test area is completely exposed to severe weather conditions, and has been subject to traffic tie-ups in past winters.

course.

Each heating unit consisted of 1,420 ft of single conductor heating wire with suitable lengths of cold conductor connected to each end.

GE's Computer Dept. To Open Information Processing Center

General Electric Company's Computer Department recently announced plans for establishing an Information Processing Center in Phoenix, Ariz. The new center scheduled for opening next July, will offer computing services to business and industry in Texas and the southwest.

The Center will be located on the ground floor of a two-story building to be erected in the new Empire Central industrial development four miles northwest of this city.

The new Information Processing Center will feature the GE 225 general purpose computer, tape units, high-speed document handlers, and other computer peripheral equipment.

* * *

Development of an unusual fluorescent light bulb, involving a major change in fluorescent lighting, was announced recently by the Duro-Test Corp.

Utilizing a new principle in fluorescent tube design, the bulb produces, according to the company, the brightest fluorescent light yet developed for commercial and household use by the lighting industry.

* * *

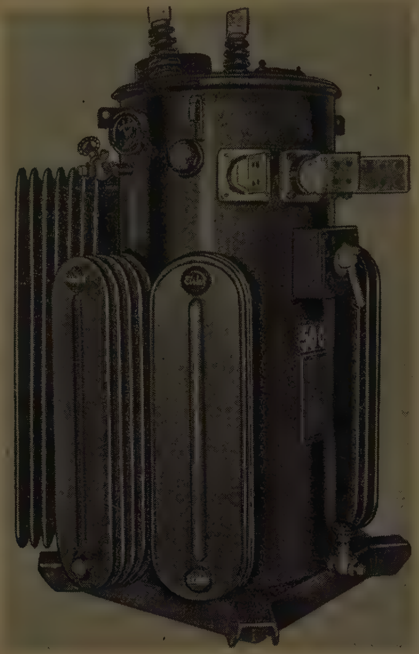
The Second National Electric Comfort Heating Exposition and Symposium which opens in Chicago at the Hotel Sherman, March 19, 1962, will present a concentrated collection of displays showing the latest in electric heating.

Registrants at the Exposition will be able to attend three general sessions and select seminars where pertinent topics will be covered. There will be 14 such sessions in the Symposium during the three days, and each of them will be held at least twice. This will enable registrants to attend more than one. The program is being arranged so that each registrant will be able to attend several seminars without duplication.

A Westinghouse Metal-Clad Switchgear advantage to you: **Horizontal drawout construction of DH breakers makes inspection, maintenance and replacement quick and easy**

For complete facts on Westinghouse metal-clad switchgear using DH magnetic air circuit breakers, contact your Westinghouse representative or write to Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa.
You can be sure . . . if it's **Westinghouse**
J-61022

EISLER TRANSFORMERS IMPULSE TESTED
OIL FILLED • DRY TYPE • ASKAREL IMMERSED
SPECIAL AND STANDARD



EISLER TRANSFORMERS ARE DURABLE, ACCURATE AND DEPENDABLE . . . *Made in sizes up to 3500 KVA.*

EISLER RADIATORS MADE TO YOUR SPECIFICATIONS. WRITE FOR MORE INFORMATION.

EISLER TRANSFORMER COMPANY, INC.
20 NORTH SALEM ST.
DOVER, NEW JERSEY

NEW

SUPER SAFE ROPE

FIELD TEST PROVEN TO HAVE LOWEST ELECTRICAL CONDUCTIVITY!

Berkley

GLADIATOR
"MADE STRONGER ... TO LAST LONGER"
PAT. PENDING TRADEMARK

POLYPROPYLENE ROPE
AND POLYETHYLENE ROPE

Berkley Gladiator Polypropylene rope and Polyethylene rope — from 3/16 to 2" in diameter — is the ideal rope for hand lines, pulling transmission cables, for block tackle, etc. This new rope sheds water and is completely rot-resistant — thus giving it a very low ELECTRICAL CONDUCTIVITY. Extra easy to handle because it is light in weight, yet 50% stronger than manila. It can be easily spliced and carries a stronger knot strength than manila. Berkley's new safe-to-handle Gladiator rope will do a better job for you.

Please rush me sample, costs and fact sheets on Polypropylene.
NAME________________COMPANY________________
ADDRESS________________________________
CITY________________STATE________________
☐ Check here if you want a Berkley representative to call on you.
How much footage of rope do you purchase a year?

BERKLEY & COMPANY • SPIRIT LAKE, IOWA

NUCLEAR POWER—*from p. 58*

type which offer the greatest probability of meeting our 1968 objective are constructed at the earliest time. Research and development assistance, and waiver of fuel use charge—both of which are possible under our present authority — can represent very important government contributions — ones which should be strong incentives to industry to move ahead in that phase of the program which has always been considered to be a primary responsibility of industry — construction of commercial scale plants."

Nuclear Material Ownership

Discussing the result of deliberations and discussions with "outside interests" on the subject of ownership of special nuclear material, Dr. Seaborg pointed out that all concerned recognize that "a sudden imposition of a requirement for private ownership could well be a serious blow to the newly born and still insecure nuclear power industry." He concluded, however:

"There are persuasive reasons which might indicate the desirability of early legislative action which if approved would eliminate the mandatory requirement of government ownership and open the door for an orderly—and undoubtedly lengthy — transition from the present situation where the government (1) owns and leases the fuel for reactors, (2) credits the operation for unused and degraded fuel at input value, and (3) is obligated to purchase all reactor produced special nuclear material at a figure based on its fair price for its intended use—to a situation under which reactor fuel and reactor products take their place as normal items of commerce in a free and competitive market.

"If it is decided to proceed with a request for such modification of the Atomic Energy Act, we would expect to pursue this matter vigorously with Congress. We intend that nuclear power will be an established self sufficient industry before it will be forced to accept the full economic burden and responsibility which go with private ownership of special nuclear material.

"We would anticipate that during

the transition period, fuel would continue to be leased, and unused fuel and plutonium would be credited at prices consistent with their value as nuclear fuels. The Commission and hopefully the nuclear industry will continue an aggressive research and development program for the use of such fuels for reactor systems."

(Dr. Seaborg was asked to comment on one rumored development that would have a disquieting effect on at least some parts of the "still insecure" nuclear power industry — the possibility of a government cutback in funding the civilian atomic power program. He noted that the schedule of reactors to be built as published in recent AEC reports remained flexible, but was up for discussion currently.)

Government-Industry Research

Air Force Secretary Zuckert, in a luncheon address for the AIF-ANS conference, offered another hint that the Administration is looking more to private industry effort as compared to more investment in government facilities. In a discussion of "the government-industry research team," the former member of the Atomic Energy Commission concluded by suggesting that "we should resist or at least question the built-in tendency for government to acquire more facilities and conduct more research on its own account." He proposed resolving the question "in favor of concentrating on work that must be done or can be done only in government laboratories, and to the end of consciously strengthening the nation's industrial R & D capability."

Nuclear Liability Problems

Edward Spencer, treasurer of the Detroit Edison Co., identified as one of the most persistent problems that has arisen from the approach of placing as much financial responsibility as possible upon the operator of a nuclear facility the problem of suppliers' liability for on-site nuclear damage. He noted the common practice of suppliers obtaining release of liability from owner-operators of nuclear facilities, but reported that such a contractural release can become difficult or im-

A Westinghouse
Metal-Clad Switchgear
advantage to you:
Limitrak* insulation system provides superior, balanced protection

+ —

For complete facts on the total Limitrak insulation system used in metal-clad switchgear, contact your Westinghouse representative or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.
You can be sure . . . if it's **Westinghouse**
*Trademark
J-61023

Searching for Test Facilities?

look to . . .

SUPERIOR SWITCHBOARD & DEVICES CO.
CANTON 1, OHIO
A Subsidiary of
The Union Metal Manufacturing Co.

Test Switch

Write for a free Catalog outlining types and sizes of test switches, test blocks, reactiformers, enclosures and meter socket equipment.

Dome-shaped reactor containment sphere is conspicuous by its absence in this General Electric model of a boiling water nuclear power plant of the future, shown on display at the recent Atom Fair.

possible if the supplier is "remote in his relationship with the owner-operator or if his bargaining position is poor." He proposed the desirability of a more general solution, either through some revisions in present insurance contracts, by revisions in current legislation, or by both.

Reactor Safety Stressed

In a panel discussion of reactor safety considerations, moderated by Louis H. Roddis, Jr., president of the Pennsylvania Elect. Co., these were among points which received emphasis from one or more of the eleven panelists:

1. In this stage of the art, we cannot exchange distance for engineered safety . . . but we should definitely move in this direction.—Clifford K. Beck, deputy director of the AEC's division of regulation.

2. Though opinion seems to be about evenly divided as to whether or not separate safety review criteria can be written for spcific reactors, with the hope that these can then be applied to reactors generally, "I don't think general criteria will result."—W. E. Johnson, atomic power dept., Westinghouse.

3. About reactor accidents — Accidents which have happened thus far have been similar to but less severe than those in simulated experiments (Beck); most accidents start with pipe ruptures (Paul Schmitz of Bechtel Corp.); acci-

PENGO AUGERS
Save you money 4 ways

PENGO HEAVY-DUTY Twin Helix Augers—14" through 96" hole diam.

1. **BORE FASTER**...put real "teeth" in earth drilling, save wear and tear on your diggers.
2. **STAY ON THE JOB LONGER**...all wearing parts replaceable in the field; no down-time for shop welding.
3. **COST FAR LESS TO MAINTAIN**...reversible teeth cost only 90¢ each, pilot bit only $8.00. Parts interchangeable on all PENGO augers you are using...less inventory!
4. **A SIZE AND TYPE FOR EVERY BORING JOB**...Augers and boring heads (for welding to your present auger) available for every make of machine from post hole diggers to largest heavy-duty earth drills. Write for catalog.

PENGO Prope®

—the most satisfactory construction rope available today!

- GREAT STRENGTH (8,200 lbs. for ¾" diameter)
- LIGHT WEIGHT (11 lbs. per 100 ft. ¾" diameter)
- HANDLES AND SPLICES LIKE MANILA in any climate or weather
- WATERPROOF (even salt water); can't mildew or rot. Excellent dielectric properties.

PENGO-Prope is a synthetic rope of special construction available in all popular diameters from 3/16" to 2"; regular construction in sizes smaller than 3/16". Write for specifications, prices.

PETERSEN ENGINEERING COMPANY, INC.
Santa Clara, California
Axminster 6-7712

dents can be divided into two categories; those you design against and those you don't (Miles Leverett, consulting engineer to GE's Hanford Atomic Products Operation).

4. About containment — Relaxation of containment requirements can be expected (Robert E. Kettner, director of nuclear activities, Consumers Power Co.); We must look to the future relaxation and even elimination of the "third wall" of containment, since we design the first two (the fuel container and coolant) to be safe in themselves (C. B. Graham, mgr. nuclear power dept., Allis-Chalmers).

METERING LIQUIDS . . .

(Continued from page 43)

and nitrogen. However, hydrazine has only recently established industrial utility because it is normally difficult to pump and is dangerous if openly exposed to personnel.

Hydrazine is known to exhibit toxic effects from ingestion, inhalation of vapors, or contact with the skin. Solutions containing 40 percent N_2H_4 or more are combustible. Exposure of hydrazine solutions to air should be kept to a minimum in order to reduce losses through oxidation. Hydrazine crystalizes at temperatures below 60F. If a pump has a stuffing box, these crystals can be very damaging to packing glands. A pump handling the material is usually placed on a cement platform: if leakage occurs, the highly alkaline material quickly eats into and damages cement floors.

To date, metering problems RG&E anticipated have been overcome. Since metering units used by the company have no stuffing boxes, the problem of leakage and replacement of packing is non-existent. Valve seats and diaphragms on the units are specifically designed for the chemicals they are handling and are highly resistant to corrosion. In addition to safely handling extremely toxic liquids, an important benefit is the convenience of being able to quickly and easily adjust feed rates in infinite increments from zero to 100 percent of pump capacity. The result: the Alex Beebee demineralizing system is capable of yielding high quality water from low grade raw water, operates at high flow rates—and at a low operational cost.

A Westinghouse V-2 Disconnecting Switch advantage to you:
Totally-enclosed counterbalancing mechanism rides on almost frictionless Delrin rollers — provides proper blade balance in any mounting position, under all conditions

For complete facts on V-2 disconnecting switches, contact your Westinghouse representative or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.
You can be sure . . . if it's **Westinghouse**
J-61024

ELECTRIC LIGHT AND POWER

Annual Index

Index to Volume 39, January-December, 1961

ACCOUNTING

NSP Returns to Envelope Billing, Mar. 15, page 51
Productivity Records Lead To Better Crew Management, Performance, Mar. 15 page 60

AREA DEVELOPMENT

Quality Service Attracts Industrial Customers, Dec. 15, page 37
Utilities Have Big Stake in Salt Water Conversion, Oct. 15, page 34

AUTOMATION

Automatic Purchasing Requisitions, Aug. 15, page 40
Carrier Control Of Remote Switched Capacitors Maintains Station Reactive Levels, Mar. 1, page 38
Desired Generation Computer Aids System Operation and Production, Sept. 15, page 52
Diesel Unit Guards Town—Economically, May 1, page 52
Electric Heat Cuts Costs At Push-Button Asphalt Plant, Aug. 1, page 35

CABLES

Diagnosis of PILC Cable Failures Helps Prevent Outages, May 15, page 58
Distribution Capacitors Go Underground In Philadelphia, Mar. 15, page 54
How 300-Kv Submarine Cables Were Laid Across The Oslofjord, Apr. 1, page 38
Short-Circuit Characteristics of Spacer Cable, Oct. 15, page 31
Techniques for Locating Cable Faults, Oct. 1, page 19

CAPACITORS

Capacitors Switched Via Coded Mobile Radio Control, July 15, page 62
Carrier Control of Remote Switched Capacitors Maintains Station Reactive Levels, Mar. 1, page 38
Distribution Capacitors Go Underground In Philadelphia, Mar. 15, page 54

COMMUNICATIONS

Capacitors Switched Via Coded Mobile Radio Control, July 15, page 62
New Underground Dispatching Center Resists Radioactive Fallout, June 1, page 34
Tellurometer Survey Maps 1100 Mile Microwave System, Sept. 15, page 62

COMPUTERS

Computer Analysis Illuminates the Future of Distribution Voltages, Sept. 1, page 20
Desired Generation Computer Aids System Operation and Production, Sept. 15, page 52
Digital Computer Programs Speed Short Circuit Studies, Jan. 1, page 38

CONDUCTORS

Aluminized Steel Core Wire Improves ACSR Performance, July 15, page 58
Conductor Vibration Damping, Sept. 15, page 60
Deadly Conductor Vibration Subdued, Nov. 15, page 42
Hollow Alminum Conductor Proves Reliable on 230-kv Wood-Pole Line, Oct. 15, page 34
Short-Circuit Characteristics of Spacer Cable, Oct. 15, page 31

CONSTRUCTION

Apple Grove Project, Aug. 15, page 44
Concrete Placement Gigantic Challenge at Glen Canyon, Aug. 15, page 51
Conductor Vibration Damping, Sept. 15, page 60
Electric-Utility Construction Hits $4.6-Billion for 1961—Up 8.9%, Feb. 1, page 52
Energization of 750-KV Project EHV Marks Milestone in Transmission Research, Jan. 15, page 48
Frequency-Zero Means No Accidents, Mar. 15, page 58
How 300-Kv Submarine Cables Were Laid Across The Oslofjord, Apr. 1, page 38
Modern Techniques Help Answer The Question: How Much Can A Guy Anchor Hold?, Mar. 1, page 41
Productivity Records Lead To Better Crew Management, Performance, Mar. 15, page 60
Stornorrfors Sweden's Largest Hydroelectric Power Plant, Mar. 15, page 64
Tellurometer Survey Maps 1100 Mile Microwave System, Sept. 15, page 62
The Taum Sauk Development—Part 1, April 15, page 46
The Taum Sauk Development—Part II, May 1, page 44
Upper Mississippi Valley Power Pool, May 15, page 56
Utilities' Year-End Statements Spell Out Big Construction Plans, Feb. 1, page 56

CONTROL

Capacitors Switched Via Coded Mobile Radio Control, July 15, page 62
Carrier Control of Remote Switched Capacitors Maintains Station Reactive Levels, Mar. 1, page 38
Desired Generation Computer Aids System Operation and Production, Sept. 15, page 52
New Underground Dispatching Center Resists Radioactive Fallout, June 1, page 34
Research Answers Serious Stack-Emission Problem, Oct. 1, page 30
Tellurometer Survey Maps 1100 Mile Microwave System, Sept. 15, page 62

DISPATCHING

Desired Generation Computer Aids System Operation and Production, Sept. 15, page 52
New Underground Dispatching Center Resists Radioactive Fallout, June 1, page 34
Power Pool Has "Flywheel Effect" On Income Statement, April 15, page 50

DISTRIBUTION

Aluminized Steel Core Wire Improves ACSR Performance, July 15, page 58
Arborist Calls Utility-Sponsored Tree Program "Best In World," April 15, page 53
Arrester Reliability Proved By Utility Field Test, Dec. 1, page 32
Carrier Control Of Remote Switched Capacitors Maintains Station Reactive Levels, Mar. 1, page 38.
Computer Analysis Illuminates The Future Of Distribution Voltages, Sept. 1, page 20
Decorative Post Lanterns Solve Residential Street Lighting Problem, Feb. 15, page 36
Diesel Unit Guards Town—Economically, May 1, page 52
Distribution—Area Of Opportunity, July 1, page 44
Distribution Capacitors Go Underground In Philadelphia, Mar. 15, page 54
Economics Of Higher Distribution Voltage, Mar. 1, page 36
Effects Of 65 Degrees Rise Transformers On Distribution Design, July 15, page 65
Field Investigation Of Breaker Performance, Feb. 15, page 48
How To Drastically Reduce Line-Department Costs!, Aug. 15, page 46
Modern Techniques Help Answer The Question: How Much Can A Guy Anchor Hold?, Mar. 1, page 41
New Methods Spur Interest In Residential Underground Service, Nov. 15, page 38
Privately-Owned Distribution System Cuts Service Costs For Office Building, June 15, page 66
Productivity Records Lead To Better Crew Management, Performance, Mar. 15, page 60
Quality Service Attracts Industrial Customers, Dec. 15, page 37
Techniques For Locating Cable Faults, Oct. 1, page 19
Unique Electrical Supply Used For Marina City Development, Dec. 15, page 48
Versatile Mobile Substation Fulfills Three Service Needs, Mar. 1, page 44
Watch Phase Designation In Loop Circuits, June 1, page 41
What Service Voltages In The Future?, May 1, page 48

ELECTRIC HEATING

Customer Training Courses Aid Sales Program, Sept. 15, page 58
Electric Heat Cuts Costs At Push-Button Asphalt Plant, Aug. 1, page 35
Power Use: Up 225 Percent In Next 15 Years, Feb. 1, page 45
RG&E Creates Integrated Environment In Headquarters Building, May 1, page 51
Stored Water Space Heating Is Practical When Using Off-Peak Power, Dec. 1, page 23
Thermal-Storage Space Heating Gains In Scotland, Aug. 1, page 44

EMPLOYEE RELATIONS

Productivity Records Lead To Better Crew Management, Performance, Mar. 15, page 60

FOREIGN PRACTICES

Stornorrfors Sweden's Largest Hydroelectric Power Plant, Mar. 15, page 64
Thermal-Storage Space Heating Gains In Scotland, Aug. 1, page 44

GENERAL INTEREST

Aiming For The Future, July 1, page 38
Cereal Crops On Fly Ash, Sept. 1, page 31
Electric Power's Future Begins At 80, July 1, page 41
How Utilities Can Cut Benefit Plan Costs, Dec. 1, page 28

Microfilming Cuts File Space, Adds Security, Dec. 15, page 44
Natural Hazards And The Utility Industry, Feb. 15, page 40
Stop Shock!!, Oct. 1, page 33
Stored Water Space Heating Is Practical When Using Off-Peak Power, Dec. 1, page 23
Tellurometer Survey Maps 1100 Mile Microwave System, Sept. 15, page 62
The EEI'S Expanded Research Program, July 1, page 40
The Political And Economic Climate Ahead, July 1, page 39
Unique Electrical Supply Used For Marina City Development, Dec. 15, page 46
Will Russia Catch Up?, July 1, page 45

GENERATION

Atomic Futures, July 1, page 48
Cereal Crops On Fly Ash, Sept. 1, page 31
Concrete Placement Gigantic Challenge At Glen Canyon, Aug. 15, page 51
Copper-Silver Alloys Save Con Edison Thousands, Aug. 15, page 48
Desired Generation Computer Aids System Operation and Production, Sept. 15, page 52
Diesel Unit Guards Town—Economically, May 1, page 52
Dresden Nuclear Power Station, Nov. 1, pages 22, 23
Elk River Project, Nov. 1, pages 30, 31
Enrico Fermi Atomic Power Plant, Nov. 1, page 26
Epoxy Resin Repairs Save Pump Diffuser Section $, April 1, page 36
Future Power Progress Report, July 1, page 42
Hallam Nuclear Power Facility, Nov. 1, page 32
Hydro Plants Help Provide Peaking Capacity Economically, Sept. 1, page 28
Indian Point Atomic Power Plant, Nov. 1, page 28
Mercer Generating Station Design Is Unique, Dec. 1, page 26
Metering Difficult Liquids, Dec. 15, page 42
Piqua Power Facility, Nov. 1, page 32
Research Answers Serious Stack-Emission Problem, Oct. 1, page 30
Saxton Reactor Plant, Nov. 1, page 33
Stainless Steel Ups Condenser Tube Life 300%, Jan. 15, page 54
Stornorrfors Sweden's Largest Hydroelectric Power Plant, Mar. 15, page 64
The Taum Sauk Development—Part I, April 15, page 46
The Taum Sauk Development—Part II, May 1, page 44
Utilities Have Big Stake In Salt Water Conversion, Oct. 15, page 36
Yankee Nuclear Power Station, Nov. 1, page 24

LIGHTING

Are Foot-Candle Levels Too High?, Aug. 1, page 40
Customer Training Courses Aid Sales Program, Sept. 15, page 58
Employees Sell Over 200 Area Lights Weekly, Sept. 1, page 18
RG&E Creates Integrated Environment In Headquarters Building, May 1, page 51

LOAD BUILDING

Are Foot-Candle Levels Too High?, Aug. 1, page 40
Customer Training Courses Aid Sales Program, Sept. 15, page 58
Decorative Post Lanterns Solve Residential Street Lighting Problem, Feb. 15, page 36
Electric Heat Cuts Costs At Push-Button Asphalt Plant, Aug. 1, page 35
Employees Sell Over 200 Area Lights Weekly, Sept. 1, page 18
Home Service Takes On New Roles, Aug. 1, page 38
How Effectiveness Ratings Can Motivate Sales For A Non-Merchandising Utility, Jan. 1, page 30
People-To-People-Approach Sells Medallion Homes, Aug. 1, page 42
Power Use: Up 225 Percent In Next 15 Years, Feb. 1, page 45
Privately-Owned Distribution System Cuts Service Costs For Office Building, June 15, page 66
Quality Service Attracts Industrial Customers, Dec. 15, page 37
Stored Water Space Heating Is Practical When Using Off-Peak Power, Dec. 1, page 23
The All-Electric Future, July 1, page 47
Thermal-Storage Space Heating Gains In Scotland, Aug. 1, page 44
Utilities Have Big Stake In Salt Water Conversion, Oct. 15, page 36
What Service Voltages In The Future?, May 1, page 48
What The Company Expects From The Power Sales Engineer, Aug. 1, page 36

MAINTENANCE

Arborist Calls Utility-Sponsored Tree Program "Best In World," April 15, page 53
Conductor Repaired On 345-kv Line With Bare Hands, Aug. 15, page 38
Conductor Vibration Damping, Sept. 15, page 60
Copper-Silver Alloy Saves Con Edison Thousands, Aug. 15, page 48
Diagnosis Of PILC Cable Failures Helps Prevent Outages, May 15, page 58
Epoxy Resin Repairs Save Pump Diffuser Section $, April 1, page 36
Field Investigation Of Breaker Performance, Feb. 15, page 48
How To Drastically Reduce Line-Department Costs!, Aug. 15, page 46
Modern Techniques Help Answer The Question: How Much Can A Guy Anchor Hold?, Mar. 1, page 41
Problems In Safety Grounding For Line Work, Jan. 15, page 50
Productivity Records Lead To Better Crew Management, Performance, Mar. 15, page 60
Stainless Steel Ups Condenser Tube Life 300%, Jan. 15, page 54
Tests Prove Practicability Of 460-KV Live-Line Maintenance, April 1, page 34
Transformer Cosmetology—(How To Get Good Transformer Coatings), Oct. 15, page 41
Transformer Repainting Reduced By New Paint, Field Tests Show, Mar. 1, page 33
Versatile Mobile Substation Fulfills Three Service Needs, Mar. 1, page 44

MANAGEMENT

Aiming For The Future, July 1, page 38
Atomic Futures, July 1, page 48
Automatic Purchasing Requisitions, Aug. 15, page 40
Computer Analysis Illuminates The Future Of Distribution Voltages, Sept. 1, page 20
Customer Training Courses Aid Sales Program, Sept. 15, page 58
Desired Generation Computer Aids System Operation and Production, Sept. 15, page 52
Distribution—Area of Opportunity, July 1, page 44
Electric Power's Future Begins At 80, July 1, page 41
Future Power Progress Report, July 1, page 42
How Effectiveness Rating Can Motivate Sales For A Non-Merchandising Utility, Jan. 1, page 30
How To Drastically Reduce Line-Department Costs!, Aug. 15, page 46
How Utilities Can Cut Benefit Plan Costs, Dec. 1, page 28
Hydro Plants Help Provide Peaking Capacity Economically, Sept. 1, page 28
Live Better Electrically, July 1, page 48
Microfilming Cuts File Space, Adds Security, Dec. 15, page 44
New Underground Dispatching Center Resists Radioactive Fallout, June 1, page 34
Power Pool Has "Flywheel Effect" On Income Statement, April 15, page 50
Productivity Records Lead To Better Crew Management, Performance, Mar. 15, page 60
Quality Service Attracts Industrial Customers, Dec. 15, page 37
Research . . . and Future Power Transmission, July 1, page 43
Stop Shock!, Oct. 1, page 33
The All-Electric Future, July 1, page 47
The EEI'S Expanded Research Program, July 1, page 40
The Electric Industry Continues Its Record-Making Growth, Feb. 1, page 40
The Political and Economic Climate Ahead, July 1, page 39
The Taum Sauk Development—Part I, April 15, page 46
The Taum Sauk Development—Part II, May 1, page 44
Tomorrow's Managers, July 1, page 50
Utilities Have Big Stake In Salt Water Conversion, Oct. 15, page 36
What The Customer Expects From The Power Sales Engineer, Sept. 1, page 26
Will Russia Catch Up?, July 1, page 45
World's Fair Progress Report, July 1, page 51

MATERIALS HANDLING

Concrete Placement Gigantic Challenge At Glen Canyon, Aug. 15, page 51
New Central Warehouse Saves CL&P $300,000, Jan. 15, page 42

NUCLEAR POWER

Atomic Futures, July 1, page 48
Dresden Nuclear Power Station, Nov. 1, pages 22, 23
Elk River Reactor, Nov. 1, pages 30, 31
Enrico Fermi Atomic Power Plant, Nov. 1, page 26
Hallam Nuclear Power Facility, Nov. 1, page 32
Indian Point Atomic Power Plant, Nov. 1, page 28
Piqua Nuclear Power Facility, Nov. 1, page 32
Saxton Reactor Plant, Nov. 1, page 33
Yankee Nuclear Power Station, Nov. 1, page 24

OPERATION

Arrester Reliability Proved By Utility Field Test, Dec. 1, page 32

Carrier Control Of Remote Switched Capacitors Maintains Station Reactive Levels, Mar. 1, page 38
Computer Analysis Illuminates The Future Of Distribution Voltages, Sept. 1, page 20
Conductor Vibration Damping, Sept. 15, page 60
Desired Generation Computer Aids System Operation and Production, Sept. 15, page 52
Diesel Unit Guards Town—Economically, May 1, page 52
Digital Computer Programs Speed Short Circuit Studies, Jan. 1, page 38
Distribution—Area of Opportunity, July 1, page 44
Distribution Capacitors Go Underground In Philadelphia, Mar. 15, page 54
Effects Of 65 Degrees Rise Transformers On Distribution Design, July 15, page 65
Energization Of 750-Kv Project EHV Marks Milestone In Transmission Research, Jan. 15, page 48
Evaluation of Tie Capacity Between Pools Or Systems, Nov. 15, page 33
Field Investigation Of Breaker Performance, Feb. 15, page 48
Frequency-Zero Means No Accidents, Mar. 15, page 58
How To Drastically Reduce Line-Department Costs!, Aug. 15, page 46
Hydro Plants Help Provide Peaking Capacity Economically, Sept. 1, page 28
K-Dar Relaying Masterminds Fault Clearance, June 15, page 58
Modern Techniques Help Answer The Question: How Much Can A Guy Anchor Hold?, Mar. 1, page 41
New Underground Dispatching Center Resists Radioactive Fallout, June 1, page 34
Power Pool Has "Flywheel Effect" On Income Statement, April 15, page 50
Problems In Safety Grounding For Line Work, Jan. 15, page 50
Productivity Records Lead To Better Crew Management, Performance, Mar. 15, page 60
Quality Service Attracts Industrial Customers, Dec. 15, page 37
Stainless Steel Ups Condenser Tube Life 300%, Jan. 15, page 54
Stornorrfors Sweden's Largest Hydroelectric Power Plant, Mar. 15, page 64
Techniques For Locating Cable Faults, Oct. 1, page 19
Tellurometer Survey Maps 1100 Mile Microwave System, Sept. 15, page 62
Tests Prove Practicability Of 460-Kv Live-Line Maintenance, April 1, page 34
The Taum Sauk Development—Part I, April 15, page 46
The Taum Sauk Development—Part II, May 1, page 44
Versatile Mobile Substation Fulfills Three Service Needs, Mar. 1, page 44
Watch Phase Designation In Loop Circuits, June 1, page 41
What Service Voltages In The Future? May 1, page 48

PERSONNEL

Home Service Takes On New Roles, Aug. 1, page 38
How Effectiveness Rating Can Motivate Sales For A Non-Merchandising Utility, Jan. 1, page 30
Problems In Safety Grounding For Line Work, Jan. 15, page 50
Productivity Records Lead To Better Crew Management, Performance, Mar. 15, page 60
Tests Prove Practicability of 460-Kv Live-Line Maintenance, April 1, page 34
Tomorrow's Managers, July 1, page 50
What The Company Expects From The Power Sales Engineer, Aug. 1, page 36

PLANNING

Aiming For The Future, July 1, page 38
Arborist Calls Utility-Sponsored Tree Program "Best In World", April 15, page 53
Conductor Vibration Damping, Sept. 15, page 60
Desired Generation Computer Aids System Operation and Production, Sept. 15, page 52
Hydro Plants Help Provide Peaking Capacity Economically, Sept. 1, page 28
Tellurometer Survey Maps 1100 Mile Microwave System, Sept. 15, page 62

PLANT DESIGN

Diesel Unit Guards Town—Economically, May 1, page 52
Desired Generation Computer Aids System Operation and Production, Sept. 15, page 52
Metering Difficult Liquids, Dec. 15, page 42
Research Answers Serious Stack-Emission Problem, Oct. 1, page 30
Stornorrfors Sweden's Largest Hydroelectric Power Plant, Mar. 15, page 64
The Taum Sauk Development—Part I, April 15, page 46
The Taum Sauk Development—Part II, May 1, page 44

POLES

Design of a Lightweight Single-Circuit 138-kv Steel Tower Line, Oct. 1, page 24
Modern Techniques Help Answer The Question: How Much Can A Guy Anchor Hold?, Mar. 1, page 41

PUBLIC RELATIONS

How PEPCO Solves Right-Of-Way Acquisition Problems In Urban Areas, Jan. 1, page 34
NSP Returns To Envelope Billing, Mar. 15, page 51
Research Answers Serious Stack-Emission Problem, Oct. 1, page 30

PURCHASING AND STORES

Automatic Purchasing Requisitions, Aug. 15, page 40
Manufacturers Approach 1961 With Wary Eye, Feb. 1, page 50
New Central Warehouse Saves CL&P $300,000, Jan. 15, page 42

RATES

What Service Voltages In The Future?, May 1, page 48

REGULATION, VOLTAGE

Capacitors Switched Via Coded Mobile Radio Control, July 15, page 62
Carrier Control Of Remote Switched Capacitors Maintains Station Reactive Levels, Mar. 1, page 38
Distribution Capacitors Go Underground In Philadelphia, Mar. 15, page 54

RELAYING

Carrier Control of Remote Switched Capacitors Maintains Station Reactive Levels, Mar. 1, page 38
K-Dar Relaying Masterminds Fault Clearance, June 15, page 58

RESEARCH

Distribution—Area Of Opportunity, July 1, page 44
Energization Of 750-Kv Project EHV Marks Milestone In Transmission Research, Jan. 15, page 48
Future Power Progress Report, July 1, page 42
Modern Techniques Help Answer The Question: How Much Can A Guy Anchor Hold?, Mar. 1, page 41
Research . . . And Future Power Transmission, July 1, page 43
Tests Prove Practicability Of 460-Kv Live-Line Maintenance, April 1, page 34
The EEI's Expanded Research Program, July 1, page 40

RIGHT OF WAY

How PEPCO Solves Right-Of-Way Acquisition Problems In Urban Areas, Jan. 1, page 34
Tellurometer Survey Maps 1100 Mile Microwave System, Sept. 15, page 62

RURAL SERVICE

Diesel Unit Guards Town—Economically, May 1, page 52

SALES PROMOTION

Customer Training Courses Aid Sales Program, Sept. 15, page 58
Employees Sell Over 200 Area Lights Weekly, Sept. 1, page 18
Home Service Takes On New Roles, Aug. 1, page 38
How Effectiveness Rating Can Motivate Sales For A Non-Merchandising Utility, Jan. 1, page 30
Live Better Electrically, July 1, page 48
NSP Returns To Envelope Billing, Mar. 15, page 51
People-To-People-Approach Sells Medallion Homes, Aug. 1, page 42
What The Company Expects From The Power Sales Engineer, Aug. 1, page 36
What The Customer Expects From The Power Sales Engineer, Sept. 1, page 26
World's Fair Progress Report, July 1, page 51

SAFETY

Frequency-Zero Means No Accidents, Mar. 15, page 58
New Underground Dispatching Center Resists Radioactive Fallout, June 1, page 34
Problems In Safety Grounding For Line Work, Jan. 15, page 50
Stop Shock!!, Oct. 1, page 33
Tests Prove Practicability Of 460-Kv Live-Line Maintenance, April 1, page 34

STOREKEEPING

New Central Warehouse Saves CL&P $300,000, Jan. 15, page 42

STREET LIGHTING

Decorative Post Lanterns Solve Residential Street Lighting Problem, Feb. 15, page 36
Power Use: Up 225 Percent In Next 15 Years, Feb. 1, page 45

SUBSTATIONS

Arrester Reliability Proved By Utility Field Test, Dec. 1, page 32
Carrier Control Of Remote Switched Capacitors Maintains Station Reactive Levels, Mar. 1, page 38
Field Investigation Of Breaker Performance, Feb. 15, page 48
K-Dar Relaying Masterminds Fault Clearance, June 15, page 58
Privately-Owned Distribution System Cuts Service Costs For Office Building, June 15, page 66
Savings Can Be Realized By Proper Application Of Autotransformers, June 1, page 38
Versatile Mobile Substation Fulfills Three Service Needs, Mar. 1, page 44
Watch Phase Designation In Loop Circuits, June 1, page 41

SYSTEM PLANNING

Computer Analysis Illuminates The Future Of Distribution Voltages, Sept. 1, page 20
Diesel Unit Guards Town—Economically, May 1, page 52
Digital Computer Programs Speed Short Circuit Studies, Jan. 1, page 38
Economics Of Higher Distribution Voltage, Mar. 1, page 36
Energization Of 750-Kv Project EHV Marks Milestone In Transmission Research, Jan. 15, page 48
Evaluation Of Tie Capacity Between Pools or Systems, Nov. 15, page 33
Frequency-Zero Means No Accidents, Mar. 15, page 58
Short-Range Peak Load Prediction Method Aids System Planning, Feb. 15, page 44
The Taum Sauk Development—Part I, April 15, page 46
The Taum Sauk Development—Part II, May 1, page 44
What Service Voltages In The Future?, May 1, page 48

SYSTEM STUDIES

Digital Computer Programs Speed Short Circuit Studies, Jan. 1, page 38
Evaluation Of Tie Capacity Between Pools or Systems, Nov. 15, page 33
Problems In Safety Grounding For Line Work, Jan. 15, page 50

TESTING

Apple Grove Project, Aug. 15, page 44
Arrester Reliability Proved By Utility Field Test, Dec. 1, page 32
Energization Of 750-Kv Project EHV Marks Milestone In Transmission Research, Jan. 15, page 48
Field Investigation Of Breaker Performance, Feb. 15, page 48
Short-Circuit Characteristics Of Spacer Cable, Oct. 15, page 31
Stainless Steel Ups Condenser Tube Life 300%, Jan. 15, page 54
Tests Prove Practicability Of 460-Kv Live-Line Maintenance, April 1, page 34

TRAINING

Customer Training Courses Aid Sales Program, Sept. 15, page 58
Productivity Records Lead To Better Crew Management, Performance, Mar. 15, page 60
Tests Prove Practicability Of 460-Kv Live-Line Maintenance, April 1, page 34
What The Customer Expects From the Power Sales Engineer, Sept. 1, page 26

TRANSFORMERS

Economincs Of Higher Distribution Voltage, Mar. 1, page 36
Effects Of 65 Degrees Rise Transformers On Distribution Design, July 15, page 65
New Transformer Design Offers Substantial Savings, May 15, page 62
Savings Can Be Realized By Proper Application Of Autotransformers, June 1, page 38
Transformer Cosmetology—(How To Get Good Transformer Coatings), Oct. 15, page 41
Transformer Repainting Reduced By New Paint, Field Tests Show, Mar. 1, page 33
Versatile Mobile Substation Fulfills Three Service Needs, Mar. 1, page 44

TRANSMISSION

Aluminized Steel Core Wire Improves ACSR Performance, July 15, page 58
Apple Grove Project, Aug. 15, page 44
Application Of All-Aluminum Conductors To Transmission Lines, June 15, page 63
Arrester Reliability Proved By Utility Field Test, Dec. 1, page 32
Conductor Repaired On 345-Kv Live Line With Bare Hands, Aug. 15, page 38
Conductor Vibration Damping, Sept. 15, page 60
Deadly Conductor Vibration Subdued, Nov. 15, page 42
Design Of A Lightweight Single-Circuit 138-Kv Steel Tower Line, Oct. 1, page 24
Energization Of 750-Kv Project EHV Marks Milestone In Transmission Research, Jan. 15, page 48
Evaluation Of Tie Capacity Between Pools Or Systems, Nov. 15, page 33
Field Investigation Of Breaker Performance, Feb. 15, page 48
Hollow Aluminum Conductor Proves Reliable On 230-Kv Wood-Pole Line, Oct. 15, page 34
K-Dar Relaying Masterminds Fault Clearance, June 15, page 58
Modern Techniques Help Answer The Question: How Much Can A Guy Anchor Hold?, Mar. 1, page 41
Power Pool Has "Flywheel Effect" On Income Statement, April 15, page 50
Productivity Records Lead To Better Crew Management, Performance, Mar. 15, page 60
Research . . . And Future Power Transmission, July 1, page 43
Techniques For Locating Cable Faults, Oct. 1, page 19
Tests Prove Practicability Of 460-Kv Live-Line Maintenance, April 1, page 34
Upper Mississippi Valley Power Pool, May 15, page 56

TRANSPORTATION

Versatile Mobile Substation Fulfills Three Service Needs, Mar. 1, page 44

UNDERGROUND

Diagnosis Of PILC Cable Failures Helps Prevent Outages, May 15, page 58
Distribution Capacitors Go Underground In Philadelphia, Mar. 15, page 54
New Methods Spur Interest In Residential Underground Service, Nov. 15, page 38
Techniques For Locating Cable Faults, Oct. 1, page 19

UTILITY MAN'S NOTEBOOK

Jan. 1, page 42
Jan. 15, page 46
Mar. 1, page 32
Mar. 15, page 53
April 1, page 43
May 15, page 55
Sept. 1, page 32
Oct. 15, pages 60, 61
Dec. 15, page 52

AUTHORS

Acker, Ernest R., World's Fair Progress Report, July 1, page 51
Allen, T. J. and E. J. Allen, Arrester Reliability Proved By Utility Field Test, Dec, 1, page 32
Anderson, A. S., What Service Voltages In the Future?, May 1, page 48
Anderson, Stanley W., How To Drastically Reduce Line-Department Costs!, Aug. 15, page 46
Appleman, Ray, Diesel Unit Guards Town —Economically, May 1, page 52
Arena, J. R., Design of a Lightweight Single-Circuit 138-kv Steel Tower Line, Oct. 1, page 24
Bain, E. C. and C. G. S. Lewis, Transformer Repainting Reduced By New Paint, Field Tests Show, Mar. 1, page 33
Bank, Thor G. and H. J. Lamon, Versatile Mobile Substation Fulfills Three Service Needs, Mar. 1, page 44
Besse, Ralph M., Tomorrow's Managers, July 1, page 50
Blachly, J. H. and Elden J. Welsh and J. J. Dickson, Elk River Reactor, Nov. 1, pages 30, 31
Blackburn, J. L., and G. D. Rockefeller, K-Dar Relaying Masterminds Fault Clearance, June 15, page 58
Blank, Howard, Copper-Silver Alloy Saves Con Edison Thousands, Aug. 15, page 48
Bortner, R. L., How PEPCO Solves Right-Of-Way Acquisition Problems In Urban Areas, Jan. 1, page 34
Bovier, R. F. and W. A. Verrochi and W. H. Lambert and A. J. Tigges, Research Answers Serious Stack-Emission Problem, Oct. 1, page 30
Bowser, Robert V. and Howard C. Tyrrell, Carrier Control Of Remote Switched Capacitors Maintains Station Reactive Levels, Mar. 1, page 38
Brown, Homer E., George L. Landgren and William M. Thorn, Digital Computer Programs Speed Short Circuit Studies, Jan. 1, page 38
Bullock, Walter D., Diagnosis of PILC Cable Failures Helps Prevent Outages, May 15, page 58
Burgess, T. J., Tests Prove Practicability Of 460-Kv Live-Line Maintenance, April 1, page 34
Burns, C. C., How Utilities Can Cut Benefit Plan Costs, Dec. 1, page 28
Calvert, Clinton E., Application of All Aluminum Conductors To Transmission Lines, June 15, page 63
Carey, W. L., Short-Range Peak Load Prediction Method Aids System Planning, Feb. 15, page 44
Cassan, J. G., Problems In Safety Grounding For Line Work, Jan. 15, page 50

Chapin, S. L., What The Company Expects From The Power Sales Engineer, Aug. 1, page 36
Coe, Roger J., Yankee Nuclear Power Station, Nov. 1, page 24
Dickinson, Lewis E., Natural Hazards And The Utility Industry, Feb. 15, page 40
Dickson, J. J. and Elden J. Welsh and J. H. Blachly, Elk River Reactor, Nov. 1, pages 30, 31
Dugas, L. V. and Y. L. Hughes, Quality Service Attracts Industrial Customers, Dec. 15, page 37
Englehart, E. T., and J. E. Hall, Aluminized Steel Core Wire Improves ACSR Performance, July 15, page 58
Furber, R. D., NSP Returns To Envelope Billing, Mar. 15, page 51
Gale, Willis, The EEI's Expanded Research Program, July 1, page 40
Gillis, C. L. and J. E. Hobbs, Capacitors Switched Via Coded Mobile Radio Control, July 15, page 62
Gregg, Donald B., Deadly Conductor Vibration Subdued, Nov. 15, page 42
Gronemeyer, F. C. and Dr. Emerson Jones, Hallam Nuclear Power Facility, Nov. 1, page 32
Hafeli, Bernard W., New Methods Spur Interest in Residential Underground Service, Nov. 15, page 38
Hall, J. E. and E. T. Englehart, Aluminized Steel Core Wire Improves ACSR Performance, July 15, page 58
Harrington, E. J. and E. C. Starr, Field Investigation Of Breaker Performance, Feb. 15, page 48
Hartwell, Robert W., Enrico Fermi Atomic Power Plant, Nov. 1, page 26
Hill, Andrew E., Hollow Aluminum Conductor Proves Reliable on 230-kv Wood-Pole Line, Oct. 15, page 34
Hirsch, C. W. and Dr. Just K. Qvigstad, How 300-Kv Submarine Cables Were Laid Across The Oslofjord, Apr. 1, page 38
Hobbs, J. E. and C. L. Gillis, Capacitors Switched Via Coded Mobile Radio Control, July 15, page 62
Hollander, W. L. and Ray Martin, Modern Techniques Help Answer The Question: How Much Can A Guy Anchor Hold?, Mar. 1, page 41
Horton, J. K., The All-Electric Future, July 1, page 47
Howard, J. D., Hydro Plants Help Provide Peaking Capacity Economically, Sept. 1, Page 28
Howard, J. D. and G. S. Meyrick, Power Pool Has "Flywheel Effect" On Income Statement, Apr. 15, page 50
Hughes, Y. L. and L. V. Dugas, Quality Service Attracts Industrial Customers, Dec. 15, page 37
Hutcheson, J. A., Distribution — Area of Opportunity, July 1, page 44
Hutzler, Leroy, III, Transformer Cosmetology—(How To Get Good Transformer Coatings), Oct. 15, page 41
Jacobson, Jack, Piqua Nuclear Power Facility, Nov. 1, page 32
Jasper, Cronje, Sr., Techniques for Locating Cable Faults, Oct. 1, page 19
Johnson, W. H. and W. E. Mekolites, New Transformer Design Offers Substantial Savings, May 15, page 62
Jones, Dr. Emerson and F. C. Gronemeyer, Hallam Nuclear Power Facility, Nov. 1, page 32
Kane, Edward M., Customer Training Courses Aid Sales Program, Sept. 15, p. 58
Kinitsky, Victor A., Watch Phase Designation In Loop Circuits, June 1, page 41
Knapp, Sherman R., The Electric Industry Continues Its Record-Making Growth, Feb. 1, page 40
Knapp, Sherman R., Aiming For The Future, July 1, page 38
Lambert, W. H. and R. F. Bovier, W. A. Verrochi and A. J. Tigges, Research Answers Serious Stack-Emission Problem, Oct. 1, page 30
Lamon, H. J. and Thor G. Bank, Versatile Mobile Substation Fulfills Three Service Needs, Mar. 1, page 44
Landgren, George L., Homer E. Brown and William M. Thorn, Digital Computer Programs Speed Short Circuit Studies, Jan. 1, page 38
Larson, Robert E., Conductor Vibration Damping, Sept. 15, page 60
Lewis, C. G. S. and E. C. Bain, Transformer Repainting Reduced By New Paint, Field Tests Show, Mar. 1, page 33
Linde, Leonard J., Future Power Progress Report, July 1, page 42
Linsday, E. A., Are Foot-Candle Levels Too High?, Aug. 1, page 40
Lockie, A. M., Effects Of 65 Degrees Rise Transformers On Distribution Design, July 15, page 65
Lokay, H. E. and M. S. Schultz, Evaluation of Tie Capacity Between Pools or Systems, Nov. 15, page 33
Long, Ernest R., Stainless Steel Ups Condenser Tube Life 300%, Jan. 15, page 54
McPherson, William P., Employees Sell Over 200 Area Lights Weekly, Sept. 1, page 18
Magnesen, C. J., Automatic Purchasing Requisitions, Aug. 15, page 40
Mann, George J., What The Customer Expects From The Power Sales Engineer, Sept. 1, page 26
Martin, Ray and W. L. Hollander, Modern Techniques Help Answer The Question: How Much Can A Guy Anchor Hold?, Mar. 1, page 41
Mekolites, W. E. and W. H. Johnson, New Transformer Design Offers Substantial Savings, May 15, page 62
Meyrick, G. S. and J. D. Howard, Power Pool Has "Flywheel Effect" On Income Statement, April 15, page 50
Monfort, C. E., Jr., Productivity Records Lead To Better Crew Management, Performance, Mar. 15, page 60
Moule, John W., Thermal-Storage Space Heating Gains in Scotland, Aug. 1, page 44
Nelson, C. E., Distribution Capacitors Go Underground In Philadelphia, Mar. 15, page 54
Nichols, K. D., Atomic Futures, July 1, page 48
Peppy, L. A., Economics Of Higher Distribution Voltage, Mar. 1, page 36
Preston, E. H., Desired Generation Computer Aids System Operation and Production, Sept. 15, page 52
Qvigstad, Dr. Just K. and C. W. Hirsch, How 300-Kv Submarine Cables Were Laid Across The Oslofjord, April 1, page 38
Ragsdale, H. E., Tellurometer Survey Maps 1100 Mile Microwave System, Sept. 15, page 62
Rees, D. R., Saxton Reactor Plant, Nov. 1, page 33
Reid, Leonard R., Savings Can Be Realized By Proper Application Of Autotransformers, June 1, page 38
Reinhold, Frank M., New Central Warehouse Saves CL&P $300,000, Jan. 15, page 42
Reps, David N., Computer Analysis Illuminates The Future Of Distribution Voltages, Sept. 1, page 20
Richards, Dr. R. B., Dresden Nuclear Power Station, Nov. 1, pages 22, 23
Robertson, R. N., People-To-People-Approach Sells Medallion Homes, Aug. 1, page 42
Rockefeller, G. D. and J. L. Blackburn, K-Dar Relaying Masterminds Fault Clearance, June 15, page 58
Roehmann, L. F., Short-Circuit Characteristics of Spacer Cable, Oct. 15, page 31
Rogers, Stanley, Epoxy Resin Repairs Save Pump Diffuser Section $, Apr. 1, page 36
Scanlon, Edward H., Arborist Calls Utility-Sponsored Tree Program "Best In World," Apr. 15, page 53
Schmidt, Emerson P., The Political and Economic Climate Ahead, July 1, page 39
Schultz, M. S. and H. E. Lokay, Evaluation of Tie Capacity Between Pools or Systems, Nov. 15, page 33
Scovel, V. L., How Effectiveness Rating Can Motivate Sales For A Non-Merchandising Utility, Jan. 1, page 30
Sharp, S. M., Frequency-Zero Means No Accidents, Mar. 15, page 58
Shepherd, William M., Live Better Electrically, July 1, page 48
Smythers, H. M., Electric Heat Cuts Costs At Push-Button Asphalt Plant, Aug. 1, page 35
Sonderman, G. E., Utilities Have Big Stake In Salt Water Conversion, Oct. 15, page 36
Sporn, Philip, Electric Power's Future Begins at 80, July 1, page 41
Starr, E. C. and E. J. Harrington, Field Investigation Of Breaker Performance, Feb. 15, page 48
Stevenson, Daniel B., Privately-Owned Distribution System Cuts Service Costs For Office Building, June 15, page 66
Surles, Marguerite G., Home Service Takes On New Roles, Aug. 1, page 38
Thorn, William M., George L. Landgren and Homer E. Brown, Digital Computer Programs Speed Short Circuit Studies, Jan. 1, page 38
Tigges, A. J. and R. F. Bovier, W. A. Verrochi and W. H. Lambert, Research Answers Serious Stack-Emission Problem, Oct. 1, page 30
Tupper, Stanley B. and Raymond J. Vertovec, Stored Water Space Heating is Practical When Using Off-Peak Power, Dec. 1, page 23
Tyrrell, Howard C. and Robert V. Bowser, Carrier Control Of Remote Switched Capacitors Maintains Station Reactive Levels, Mar. 1, page 38
Vencill, G. J., The Taum Sauk Development—Part II, May 1, page 44
Vennard, Edwin, Will Russia Catch Up?, July 1, page 45
Verrochi, W. A. and R. F. Bovier, W. H. Lambert and A. J. Tigges, Research Answers Serious Stack-Emission Problem, Oct. 1, page 30
Vertovec, Raymond J. and Stanley B. Tupper, Stored Water Space Heating is Practical When Using Off-Peak Power, Dec. 1, page 23
Wade, I. L. and Dr. R. B. Richards, Dresden Nuclear Power Station, Nov. 1, pages 22, 23
Wells, W. H., New Underground Dispatching Center Resists Radioactive Fallout, June 1, page 34
Welsh, Elden J., J. J. Dickson and J. H. Blachly, Elk River Reactor, Nov. 1, pages 30, 31
Westrom, Lyle A., Stop Shock!!, Oct. 1, page 33
Whitlow, George S., The Taum Sauk Development—Part I, Apr. 15, page 46
Witts, Seth N., Upper Mississippi Valley Power Pool, May 15, page 56
Young, James F., Research . . . and Future Power Transmission, July 1, page 43

CALENDAR OF EVENTS

Dec. 12—PIP Steering Committee Meeting, Edgewater Beach Hotel, Chicago, Ill.

Jan. 11-12—EEI Transmission & Distribution Committee Meeting, Jung Hotel, New Orleans, La.

Jan. 11-13—EEI Sixth Annual Live Better Electrically Women's Conference, Edgewater Beach Hotel, Chicago, Ill.

Jan. 18-19—PEA Electrical Equipment Committee Meeting, Benjamin Franklin Hotel, Philadelphia, Pa.

Jan. 22-25—Plant Engineering & Maintenance Show & Conference, Convention Hall, Philadelphia, Pa.

Jan. 24-25—Legal and Claims Committee Meeting, Roosevelt Hotel, New Orleans, La.

Jan. 28-Feb. 2—AIEE Winter General Meeting, Hotel Statler, New York, N. Y.

Feb. 4-6—NAPA Annual Meeting, Fairmont Hotel, San Francisco, Calif.

Feb. 7-9—APPA Engineering and Operations Workshop, Peabody Hotel, Memphis, Tenn.

INDEX TO ADVERTISERS

Air Preheater Corp. 11

Aluminum Co. of America, Structural Div. 22, 23

American Steel & Wire Div., United States Steel Corp....66, 67

Babcock & Wilcox Co., Boiler Div. 20, 21

Bailey Meter Co. 34, 35

Bashlin Co., W. M.......................80

Bechtel Corp. 4

Berkley & Co. 84

Bethlehem Steel Co. 61

Brown Boveri Corp. 14

Chance Co., A. B. 30

Chevrolet Div., General Motors Corp. 24

Collyer Insulated Wire Co..........49

Combustion Engineering, Inc. 68, 69

Duncan Electric Co., Inc............29

Eisler Transformer Co., Inc........84

English Electric Co., Ltd.............71

Fargo Mfg. Co., Inc..................... 6

G & W Electric Specialty Co........65

General Electric Co., Schenectady ....18, 19, 31, 60 Inside Front Cover

Haley & Co., R. G.......................81

Indiana Steel & Wire Co., Inc...79

KPF Electric Co. 12, 13

Kerite Co. 63

Line Material Industries, McGraw-Edison Co. 25, 26, 27, 28

Micro Balancing, Inc. 81

Moloney Electric Co. 74, 75

Ohio Brass Co. 72, 73

Petersen Engineering Co. 86

Radio Corp. of America Outside Back Cover

Reliable Electric Co. 36

Rome Cable Div., Aluminum Co. of America 15, 16, 17

Sangamo Electric Co. 32, 33

Superior Switchboard & Devices Co. 86

United States Steel Corp., American Steel & Wire Div. 66, 67

Wagner Electric Corp. 53, 54, 55, 56

Westinghouse Electric Corp., Pittsburgh 83, 85, 87

Wyoming Valley Equipment Div. ....Inside Back Cover

ENGINEERING-OPERATIONS

Coal Slurry Fired Successfully At Werner Generating Station of Jersey Central Power & Light . . .

Direct firing and burning of coal slurry in a Babcock & Wilcox Cyclone Furnace Boiler was demonstrated recently at Jersey Central Power & Light Co.'s Werner Generating Station.

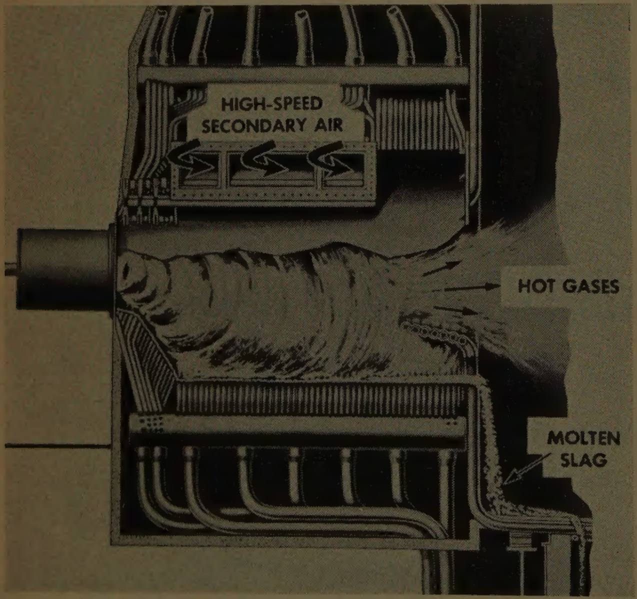
Coal slurry is a fuel consisting of finely crushed coal mixed with enough water to make a fluid. Until now, coal slurry pumped through a pipeline could be used as fuel only after expensive drying and dewatering pre-treatment. This demonstration of burning the slurry without drying culminates several years of joint research by Babcock & Wilcox Co., Consolidation Coal Co. and Texas Eastern Transmission Corp.

Complete test results of the direct firing of coal slurry at Werner Station have not yet been tabulated, according to John Logan, Jersey Central's vice president of Engineering Operations and Generation, but he said "this demonstration has proved that slurry can be burned under operating conditions."

The slurry used in the demonstration was transported through an existing pipeline running from Cadiz, Ohio, to Cleveland Electric Illuminating Co. Since no coal pipeline exists to the East Coast, the fuel was shipped the rest of the way by barge.

A proposed pipeline from the vast coal-producing areas of West Virginia and Western Pennsylvania to the East Coast is planned, Texas Eastern and Consolidation Coal reported. The pipeline will extend a distance of some 350 air-miles from its origin and will require that a number of pumping stations be installed along the route of the pipeline to keep the slurry moving to its destination. Lateral pipelines will branch away from the main line to make deliveries to numerous locations at the convenience of the customer, although certain minimum volumes and distances from the main line are essential to maintain the best economics for this form of transportation. Reliability, economy and **tremendous value to the nation in case of national emergency** were given as plusses associated with the proposed pipeline.

While many existing and all new Cyclone furnaces can operate on slurry with no auxiliary dewatering equipment, it is also possible to add equipment to remove water, thus allowing the use of coal slurry in present-day pulverized-fuel-fired plants, B&W explained.



A side view of Babcock & Wilcox Cyclone Furnace shows the introduction of slurry (which contains over 30% water), the burning process, and the separation of molten slag from the hot gases. High-velocity primary air is introduced around and behind the slurry nozzle. This vaporizes the water and accelerates the coal particles in the mixture. Ignition and burning at over 3000 F occurs within 0.01 of a second, according to Babcock & Wilcox.

New Definitions for Maximum Conductor Temperature . . .

The Insulated Power Cable Engineers Association (IPCEA) has recently released three definitions covering maximum temperature of conductors in insulated wire and cable, as follows:

1. MAXIMUM CONDUCTOR TEMPERATURE —OPERATING. The highest conductor temperature attained by any part of the cable line under operating current load.
2. MAXIMUM CONDUCTOR TEMPERATURE — EMERGENCY OVERLOAD. The highest conductor temperature attained by any part of the cable line during emergency overload of specified time, magnitude, and frequency of application.
3. MAXIMUM CONDUCTOR TEMPERATURE —SHORT CIRCUIT. The highest conductor temperature attained by any part of the cable line during a short-circuit of specified time and magnitude.

Gulf States Utilities Orders Highest-Rated Mobile Substation . . .

Gulf States Utilities Company has placed an order with the General Electric Co. to build the world's highest-capacity mobile substation, according to GE.

The new unit's rating will be 25,000 kva and will have a primary voltage of 138 kv. It will be a complete substation, consisting of a high-voltage disconnect switch, lightning arresters, fuses, three-phase power transformer, low-voltage switchgear and control, relaying equipment. All of this equipment will be mounted on a highway semi-trailer for over-the-road movement.